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that could

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is it winning the battle?

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DEAD TREE TECHNOLOGY

Writing for a monthly print magazine often means having to deal with lull periods from time to time. And by that, I don't mean lulls in the amount of work that needs to be done, but information lulls because we have to adhere to very strict deadlines in order for the magazine to reach store shelves each month. The production process to create an issue involves writers, designers, photographers, illustrators, printing presses, logistics and distribution. So, while it is now October and you've got yourself the October issue of HWM in your hands, we've been working on it since August.

Besides that, there are always things happening right smack in the middle of our process—such as the Apple iPhone 6s announcements—that we've to decide if we can squeeze into the current issue and risk blowing our deadlines or move into the next issue and risk the information being dated.

This 'traditional' production process is one of the main reasons why print has been on a decline. Its successor, the internet, cuts out all the middlemen

to deliver information instantaneously to anyone in the world who wants to view it, from anywhere in the world it is being produced.

Now, I do not dispute this. I agree that magazines can slow and cumbersome. However, that doesn't mean they no longer have a place. HWM will continue our commitment to deliver stories and trends that'll (hopefully) make you think, while our sister site at www.hardwarezone.com takes care of the all the juicy news and reviews with the immediacy you crave. Finally, to bridge both print and online, HWM on mobile and tablets lets you read unencumbered with greater interactivity, exclusive digital content and direct internet access too.

While I can't say we've succeeded in perfecting the balance between print and online, we have a better set of products today than we've ever had before.

Zachary Chan
EDITOR

SONY



XPERIA Z5

The world's best camera in a smartphone

Ultrafast autofocus and 23Megapixel camera

Up to 2 days battery life*

Waterproof design with fingerprint sensor**

Tested against leading smartphones 2015



The new Xperia Z5 with the SmartBand 2

Based on the Z5 main camera resolution (23MP), speed of autofocus (0.20-0.25sec) and image quality assessment by 200 UK consumers of the top-selling smartphones of 2015. Specification verification and consumer testing carried out by Strategy Analytics. For more information go to: www.sonymobile.com/testresults/. *Battery life has been measured against Sony Mobile Communications AB's smartphone usage profile, defined in September 2014 to represent the typical smartphone user's active condition, including but not limited to a range of usage scenarios (calling, texting, web browsing, social networking, game playing, music listening, picture taking, picture browsing, online video watching, video recording and playback). ** The Xperia Z5 is waterproof and protected against dust, so don't worry if you get caught in the rain or want to wash off dirt under a tap, but remember - all ports and attached covers should be firmly closed. You should not put the device completely underwater or expose it to seawater, salt water, chlorinated water or liquids such as drinks. Abuse and improper use of device will invalidate warranty. The device has Ingress Protection rating IP65/IP68. For more info see www.sonymobile.com/waterproof. Note: the Xperia Z5 has a cap-less USB port to connect and charge. The USB port needs to be completely dry before charging. Icons and images are simulated and are for illustrative purposes only. Sony is trademark or registered trademark of Sony Corporation. Android, Google Chrome and Google Play are trademarks of Google Inc. ©2015 Sony Mobile Communications Inc. All rights reserved. Network operator services not included.

CONTENTS

OCTOBER 2015

29 THINK

THINK

29

- BEST OF IFA 2015
- CONNECTED CARS AND HACKING
- DEEP LEARNING
- APPLE WATCH: ONE MONTH ON THE WRIST

Q&A

40

- JOHN WORRAL, CYBERARK

42

- PETER DRAW, PRESENT

44

- KIM LAU, PHOTOGRAPHER/PRODUCER

FEATURES

46

- THE APPLE MUSIC OFFENSIVE

52

- INTEL Z170 SHOWCASE

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twitter.com/
hardwarezone

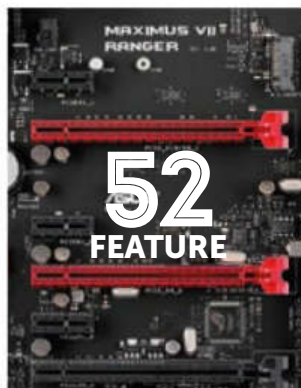


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09

GEAR

Cutting-edge Technology

60

GEEKLIFE

Corporate road warrior

64

TEST

MAINSTREAM FLAGSHIP
SMARTPHONES

- OnePlus 2
- Oppo R7
- Samsung Galaxy A8
- Xiaomi Mi Note

74

SLIM 15-INCH GAMING
NOTEBOOKS

- Aorus X5
- ASUS ROG G501
- Gigabyte P35X V3
- HP Omen

83

REVIEWS

- Adata XPG SX930
- ASUS ROG GR6
- ASUS Strix Radeon R9 380
- ASUS Strix Radeon R9 Fury
- Blue Aura X30
- Fujifilm X-T10
- Linksys EA8500
- MSI Radeon R9 390X Gaming 8G
- Samsung Galaxy Note 5
- TomTom GO 610
- Yu-Gi-Oh! Legacy of the Duelist

99

LEARN

- Android apps on PC
- Hack: Panning time-lapse video
- Microsoft Edge browser performance
- MU-MIMO wireless explained
- Remove unwanted apps from Samsung Galaxy Note 5 and S6 Edge+
- What is High Bandwidth Memory (HBM) and what can it do?
- App Attack

112

REWIND

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NEW THIS MONTH

Every month, we receive dozens of product announcements and mentions, sit through many a launch event and try out all kinds of devices. All these products are then carefully curated by our crack team of tech gurus. The final list is presented here in Gear and it is our hope you'll find something to geek-out to.



MORE INSIDE >

CASIO G-SHOCK G-STEEL
When the G-Shock grows up.

APPLE IPOD TOUCH (6TH GEN)
For Apple Music fans.

KENWOOD KH-KR900
Business chic music.

OPPO MIRROR 5S
Mainstream specs, luxe design.

SONY SMARTBAND 2

The Sony Smartband 2 has an accelerometer and heart rate sensor like many activity trackers, but it differs by being able to automatically detect activity, from running to sleeping, then logs them appropriately. It can also provide notifications through vibration and LED alerts when synced with your phone, is IP68 water-resistance and will come in four stylish colors.



AF-S NIKKOR 24-70MM F/2.8E ED VR

Said to represent the pinnacle of NIKKOR imaging optics, the AF-S Nikkor 24-70mm f/2.8E ED VR features an aspherical Extra-low Dispersion (ED) glass element, aspherical lenses and High Refractive Index elements for an optimal details. And it now comes with Nikon's advanced vibration reduction system that gives up to four stops of image correction.

RAZER WILDCAT

The Razer Wildcat controller for the Xbox One comes with multi-function shoulder and trigger buttons that can be mapped to any other button on the controller, and a four-button Quick Control Panel that includes a one-click mute button for your microphone. Other nice touches include high-carbon steel analog stick necks and aerospace-grade aluminium triggers for improved durability. The braided cable is also detachable, making it easy to stow away and transport.





SONY XPERIA M5

Sony updates their premium mid-range with the 5-inch Xperia M5. Like the M4 Aqua, the M5 is rated IP68 waterproof and dustproof but now boasts a much improved 21.5MP rear camera with 5x Clear Image Zoom, fast 0.25-second Hybrid autofocus and 4K video recording. The front camera has also been upgraded to a 13MP shooter.

KENWOOD KH-KR900

Kenwood's latest range of headphones is styled for the executive traveler. The flagship model, KH-KR900, has an over-ear design with soft ear pads for better audio immersion and long-lasting comfort. It features 40mm neodymium drivers and Kenwood's unique Quad Duct Engine for an optimally tuned audio delivery. The headphones also fold flat for easy packing with a detachable cord.





MIONIX CASTOR

Swedish gaming manufacturer Mionix has created the Castor, a right-handed mouse that equally supports palm, claw, and fingertip grip styles. It also has a dedicated pinky and ring finger support groove on the right for maximum comfort. Tracking is handled by a PMW-3310 optical sensor that claims zero positive or negative hardware acceleration and a 10,000dpi resolution. Finally, its entire body is lovingly wrapped in four layers of rubber coating for a nice, textured grip.

BRINELL SSD EVO LEATHER

This external SSD is a work of art. Clad in soft nappa leather and framed in metal, it houses a Samsung EVO mSATA SSD that is capable of sequential read and write speeds of up to 420MB/s and 300MB/s respectively. It interfaces with your PC via USB 3.0, and it's available in 250GB, 500GB and 1TB capacities.

The cable is an integrated one that tucks neatly into its side, making for a truly seamless exterior.



NEC V332W

Looking for a business or classroom projector? NEC has just updated its V series DLP portable projectors, and leading the charge is the V332W, a WXGA (1,280 x 800 pixels) model sporting 3,300 ANSI lumens brightness and 10,000:1 contrast ratio. The beamer also comes with a slew of connectivity options, including two HDMI outputs, with one of them supporting MHL for hooking up to mobile devices.





CASIO G-SHOCK G-STEEL

The new G-Shock G-Steel series by Casio is a tantalizing buy if you're attracted to pretty things that look durable. The watches are encased in a 'Layered Guard Structure' which reinforces the body with a double layered bezel with two models: GST-S110 and GST-S100 featuring different resin arrangement. The price ranges from \$349 to \$549 for different designs and colors.



LG ROLLY

The LG Rolly isn't just another Bluetooth wireless keyboard to pair with your tablet, it's a "solid rollable wireless portable" keyboard. As you can surmise, the Rolly rolls up into a compact stick for easy storage and unfolds into a keyboard with a 17mm key pitch, has a groove to set your smartphone/tablet (up to 10-inches) and lasts for about three months with a single AAA battery.

APPLE IPOD TOUCH (6TH GEN)

Apple's latest iPod Touch (6th Generation) comes with a few handy features. Our favorite is a massive 128GB internal storage for just \$588, granting us larger wiggle space for songs and movies - truly pleasant to our ears. It also plays well with Apple Music, and it comes with an 8-megapixel iSight camera for those who need to improve their selfie game.





OPPO MIRROR 5S

The Mirror 5s sports a unique rear comprising of individually cut and embossed glass sections that reflect light in different directions, creating what Oppo calls “diamond-like bling like no other”.

The phone is powered by a Qualcomm Snapdragon 410 quad-core processor, 2GB RAM and 16GB internal storage expandable to 128GB via a Micro SD card slot. It has a 1,280 x 720 pixels resolution display and dual 4G SIM-card slots.

QNAP TVS-871T

Designed for media professionals dealing with 4K or 3D workflows, the TVS-871T is the world's first NAS to support the high bandwidth Thunderbolt 2 interface. It features two Thunderbolt 2 ports that can connect to two separate systems and also two 10GbE (10Gbps) Ethernet ports, and can run both networks independently with zero interference to bandwidth. Its 8 drive bays accommodate both 2.5 and 3.5-inch drives and storage can even be expanded using QNAP's new Thunderbolt 2 NAS expansion enclosures up to 448TB.



SOCIAL MEDIA-SAVVY PHOTOGRAPHER

Gnarbox is a pocket-sized device that lets you view, backup, edit, and share photos and videos from your DSLR camera or GoPro Hero. You can upload up to 128GB of full-resolution footage from your camera to Gnarbox. The device supports microSD and SD cards, but you can transfer your images over USB as well. Gnarbox creates its own wireless hotspot, so you can organize, edit, and share your photos in the Gnarbox app from just about anywhere! **Gnarbox**

LOOK AT MY APPLE WATCH

Ever felt the need to show off your Apple Watch? The Lounge Dock is a literal pedestal. Its holding cuff is designed to be compatible with the watch's magnetic charger. It provides a variety of viewing angles, so you can use it as a desk clock when charging. The stand, complete with its stylish aluminum base and arm, helps to exude the implied value of the watch by making it appear to float on its own snooty aura. **Lounge Dock**



SIZE DOESN'T MATTER

The AMD Radeon R9 Nano is a mini-ITX graphics card that packs a full-fledged Fiji GPU. In terms of video memory, the card sports 4GB of High Bandwidth Memory. As a result, it is capable of driving Ultra HD or 4K displays with much-lowered power levels. In fact, the R9 Nano has a power draw that is rated up to 175W, which is about 40% lower than a similarly-spec'd full-sized counterpart. **AMD Radeon R9 Nano**

CLIP ON TO SEE MORE

Designed specifically for the iPhone 6 and iPhone 6 Plus, mounting this 18mm wide angle lens is a snap thanks to the special Rapid Grip Adaptor, and gives you an extended field of view that lets you see up to 50% more. The f2.0 aperture allows for clearer and brighter image capture, while a broadband multicoat ensures maximum light transmission with minimum flare and ghosting. **Inmacus HD 18mm f2.0 Wide angle lens**



PICTURES GNARBOX, LOUNGEDOCK, AMD, INMACUS

SMALL FORM FACTOR WORKSTATION

The ASUS X99M-WS is no pared-down mini-ITX offering. It is a feature-rich micro-ATX motherboard with a total of three PCIe 3.0 x16 slots, eight SATA 6Gbps ports, and a single M.2 32Gbps slot. Dual-GPU setups will run at full x16/x16 mode, so power users should be able to get the full performance benefit of two graphics cards. There's also dual Gigabit Ethernet, a 3x3 802.11ac Wi-Fi module, and two Type-A USB 3.1 ports. **ASUS X99M-WS**



A REAL LIFE WORKING PIPBOY

We rarely look at games here on HWM but in this case we'll make an exception. The Pipboy edition of Fallout 4 not only comes with the much anticipated game but also a plastic working replica of the Pipboy, a wrist mounted computer. The real life version requires a smartphone (which you place inside the plastic shell) and the Fallout 4 app but it'll function just like the game version, complete with its own screen and interactive buttons. **Fallout 4 Pipboy Edition**



ALL THAT GLITTERS ISN'T GOLD

Step aside, gaudy iPhone cases of gel and rubber. This is a proper way to pimp your iPhone. Coated with 5.0-microns thick 24-carat yellow gold, rose gold or 950 platinum of your choosing, the Lux is a cosmetic upgrade for the sophisticated iPhone owner with far too much money to spare. Do you like diamonds? Go all out, and you will be paying north of US\$200,000 for one of these decadant re-skins. **Brikk Lux for iPhone 6S**

THE DEATH STAR IN DISGUISE

Maximize your AC1900 router's performance potential with the new D-Link DWA-192 Ultra Wireless AC1900 USB 3.0 adapter - one of the first AC1900 USB Wi-Fi adapters to the hit the market. Impressive specifications aside, this USB Wi-Fi adapter also bears more than a passing resemblance to the Death Star, making it an ideal addition to the home or office of any Star Wars fans. **D-Link DWA-192 Ultra Wireless AC1900 USB 3.0 adapter**



UNBREAKABLE

Made from impermeable polycarbonate, the RugGear Apex RG702 is a tough 4.5-inch Android smartphone that is IP68 rated against dust and water, can withstand extreme temperatures of -20°C to 50°C and is drop proof up to 1.5 meters. It is powered by a Mediatek MT6582 1.3GHz quad-core processor and has Dual-SIM connectivity.

RugGear Apex RG702

IT'S OVER 4000!

DDR4 support has finally come to Intel's latest mainstream Z170 chipset, and now you can get on board with G.Skill's new Trident Z DDR4-4000MHz kit. That is, if your bank account is so inclined. This 8GB (2 x 4GB) kit has an operating voltage of 1.35-1.4V and runs at 19-25-25-45. Hand-screened Samsung IC memory chips and sleek brushed metallic-looking heatspreaders top off these high-end memory modules. **G.Skill Trident Z DDR4-4000MHz**



ONE CABLE, MANY OPTIONS

The Moshi USB-C to USB adapter makes it easy to use your regular USB peripherals with your new Macbook. The use of anodized aluminum helps to shield the cables from electromagnetic interference, allowing for reliable data transfer at high speeds. Small and portable, the USB-C to USB can even be used to charge your smartphone while you work. **Moshi USB-C to USB adapter**

NEXT-GENERATION HARDWARE

If you've set your eye on an Intel Skylake processor, you might want to pair it with this board from ASUS. The Z170 Deluxe combines a striking white aesthetic with a host of useful features like one-click optimization of system settings and an extended base clock range for greater control over overclocking. It also features dual M.2 connectors, six USB 3.1 ports, and onboard 3x3 802.11ac Wi-Fi. **ASUS Z170-Deluxe**

DIGITAL FAN CONTROL

The NZXT Grid+ V2 is a low-profile and intuitive digital fan control hub. It doesn't require a 5.25-inch bay and can be installed in any discreet location – behind your motherboard tray for instance. The software-controlled hub supports up to six individually controlled channels and up to 30 watts total output. You can name each channel for easier identification, so there's no fumbling around for the right knob to adjust the speed on a certain fan. **NZXT Grid+ V2**

HALF A TB IN THE PALM OF YOUR HANDS

Photography and video enthusiasts who crave for high performance and high capacity storage can rejoice. Kingston has just announced a new 512GB capacity addition to its family of Ultimate memory cards. The new 512GB memory card offers read speeds of up to 90MB/s and write speeds up to 45MB/s. This makes it suitable for continuous and burst shoot modes, and also for Full-HD and 3D video recording. **Kingston 512GB Ultimate SDXC Memory Card U1**



IPS MEETS G-SYNC

Acer's new XB270HU monitor finally brings two technologies that gamers have been clamoring for together: G-Sync support and an IPS panel for improved image quality. This 27-inch gaming monitor features a resolution of 2,560 x 1,440 pixels, a super fast refresh rate of 144Hz and response time of just 4ms. The stand adjusts for orientation, height and tilt and it also comes with a built-in 4-port USB 3.0 hub. **Acer XB270HU**

AN ULTRA-SIZED SELFIE SMARTPHONE

The 6-inch Sony Xperia C5 Ultra boasts twin 13-megapixel front and rear cameras, ideal for high-resolution selfies. Both front and rear cameras also include Sony's leading Exmor RS sensor, HDR for picture and video, and an easy to use preset Auto scene recognition mode that analyses and adjusts settings automatically.

Sony Xperia C5 Ultra

AFFORDABLE FLASH STORAGE

The Plextor M6V is the company's newest entry-level SSD. The M6V is powered by Silicon Motion's SMI-2246 controller and uses Toshiba's newest 15nm Toggle NAND. Claimed read and write speeds are said to be in the region of 535MB/s and 455MB/s respectively. Despite the entry-level positioning, the M6V will support Plextor's PlexTurbo caching technology, which can improve performance by as much as eight times in certain instances. The M6V will be available in 128GB, 256GB and 512GB capacities. **Plextor M6V**



CONNECT IN STYLE

Travel in executive style with the Sony stereo Bluetooth headset SBH54. You can take and make calls, see messages, listen to FM radio, all without picking up your phone. HD Voice cancels noise and sharpens your voice, making you sound crystal clear. See your notifications on the display, and wear it neatly with its practical clip and premium metal design. **Sony Stereo Bluetooth Headset SBH54**



TKL ROMER-G MECHANICAL KEYBOARD

G310 Atlas Dawn is Logitech's second mechanical keyboard with its custom Romer-G keys. Not only does it have an awesome sounding name, the keyboard offers nearly all of the features of the bigger G910 Orion Spark at a cheaper price. Being a TKL keyboard means it's light and smaller too, which is great if you don't like bulk or just don't have the space. **Logitech G310 Atlas Dawn**

HOLLYWOOD VR CAMERA

Professional filmmakers can look forward to Q4 2015 when this VR camera is expected to hit the market. It captures stereoscopic 3D video using eight synchronized global shutter sensors, and records audio with its eight in-built microphones. The result? A full 360-degree imaging and spatially accurate original sound, minus the time-consuming process of stitching a panoramic image to achieve the same VR outcome. **Nokia OZO**



PACK A SEAT

Sitpack is touted as the most compact portable seat by its Danish manufacturers. Actually, it's built more like a resting post that allows you to rest your posterior while taking weight off your legs. People who weigh more than 130kg need not apply. Sitpack folds into the size of a canned drink and weighs about 380g. To top it off, it comes in seven different colors! **Sitpack**



BUDGET-FRIENDLY APU

The A8-7670K is the latest quad-core "Godavari" APU from AMD. Packing four CPU and six GPU cores in a single package, this budget-friendly chip is ideal for building a desktop PC with AV needs. Pop in a supported discrete graphics card, and your new rig can even double up for casual gaming. **AMD A8-7670K**



ALL ABOUT THE FIT

The Hammo S folds down to about half its size to easily fit into most bags or suitcases, and feature new earcups that rotate even more than the original Hammo for an improved fit. Covered with ear muffs hand-made from protein cotton, these headphones are guaranteed to provide comfort and breathability even with extended wear.

Noontec Hammo S



CLICK CLACK

Typing on the PlayStation 4 just got a lot easier with the Nyko Type Pad. This Bluetooth keyboard hooks up to your DualShock 4 controller via the headphone jack passthrough and connects wirelessly to your console. It features a full QWERTY keyboard with a small analog nub for easier directional menu navigation. Dedicated keys for "@" and ".com" also make typing email addresses and websites simpler.

Nyko Type Pad

CAPTURED, FRAMED AND JUDGED.



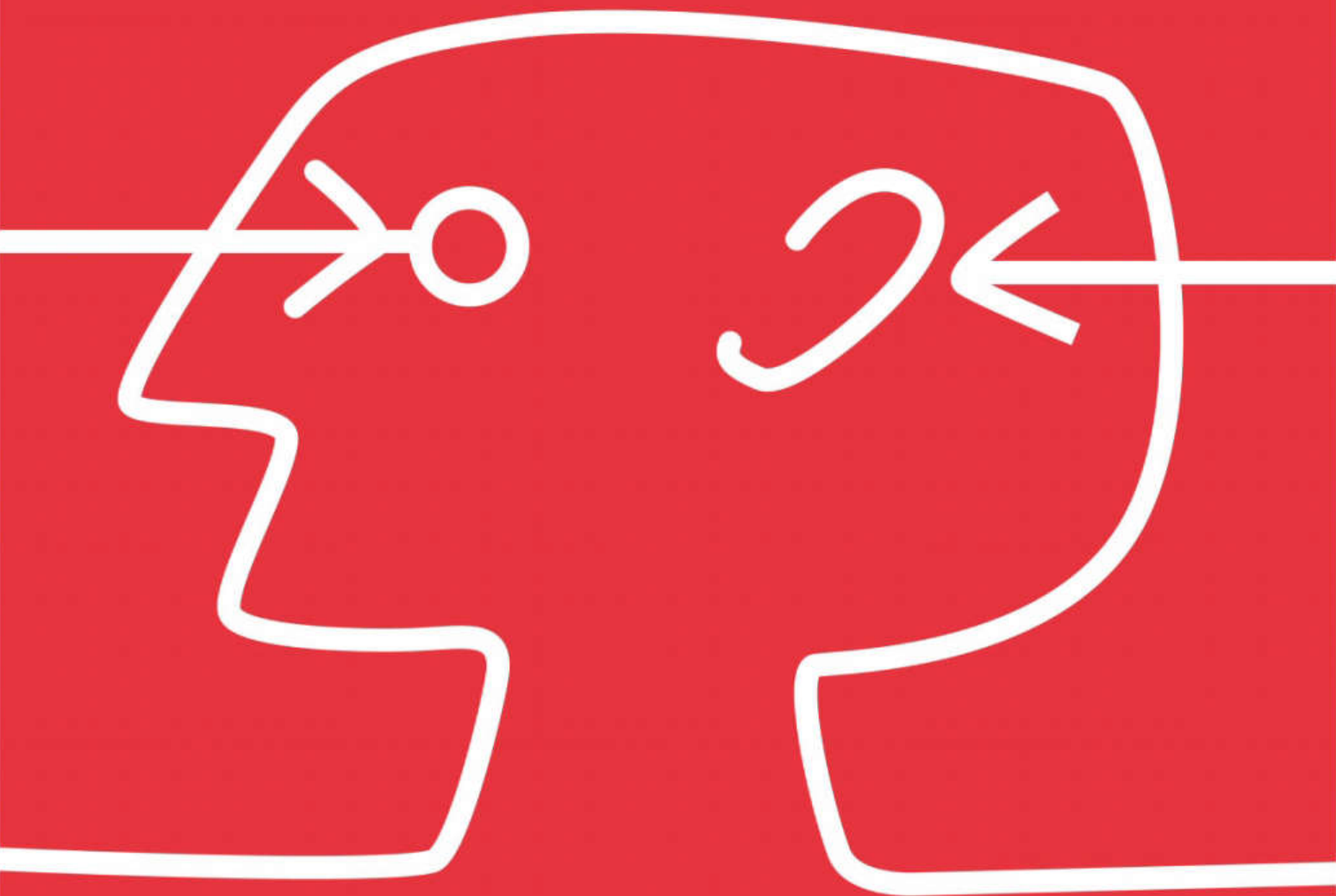
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THINK

HWM PRESENTS: THE BEST OF IFA 2015

IFA or Internationale Funkausstellung is Europe's biggest tech show and takes place every year in the capital city of Germany, Berlin. Brands from around the world take the opportunity to showcase their latest and greatest, and 2015 was no different. There were tons of new gadgets being showcased and introduced, but if you are strapped for time, here are eight coolest and must-know gadgets from this year's show.

Text by *Team HWM*

MORE INSIDE > DEEP LEARNING

If you're fearful of the day machines become self-aware and turn against humanity, it will take more than just raw performance to create artificial intelligence.

CONNECTED. HACKED.

The modern car has more electronic than mechanical parts and the next step seems to be internet connectivity, but does it make them a target for hackers?

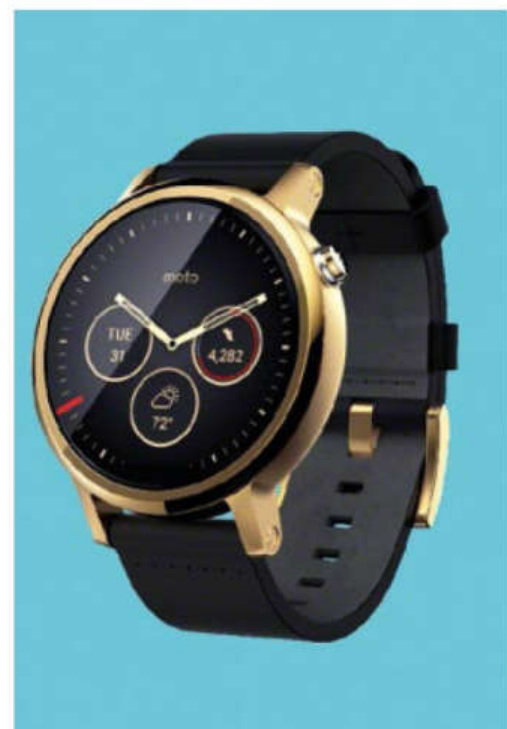


Moto 360 (2015)

The first generation Moto 360 was loved by fans because its round case and integrated lugs made it look like a regular modern day watch unlike, say the Apple Watch, which is more blocky by comparison. Keen to build on its success, Motorola has just released the next generation Moto 360 watch at IFA 2015.

This second generation Moto 360 watch will come in three sizes and can be customized with a variety of case materials, bezels, finishing and watch bands. There will be a 46mm case designed specifically for men and two 42mm cases suitable for men and women. The men's version of the 42mm case will feature 20mm wide lugs, whereas the ladies version will have smaller 16mm wide lugs. All models will have displays protected by Gorilla Glass 3 and all models will also be roughly 11.4mm thick, so it should fit comfortably under shirt cuffs.

Underneath, the new Moto 360 will be powered a quad-core Qualcomm Snapdragon 400 processor with an Adreno 305 GPU and 512MB of RAM. It will also have 4GB of internal storage. A sports model, called the Moto 360 Sport will be available late this year. That model will have built-in GPS functionality for tracking runs.



Samsung Gear S2

Not keen to let perennial Apple have all smartwatch limelight, Samsung took the chance at IFA 2015 to launch their latest and possibly greatest smartwatch.

A far cry from Samsung's previous, clunky smartwatches, the Gear S2 is a sleek, round smartwatch with a 1.2-inch AMOLED display, a stainless steel case and a ceramic bezel. That bezel is the best thing about the watch. It's the way you interact with it, rotating left or right with a light click, letting you navigate from app to app, or scrolling up and down when you're inside an app itself. Once you've scrolled to the app you want, you just tap the screen. It's such a simple and intuitive design for a watch, it's amazing no-one has thought of it before.

Like most of Samsung's recent smartwatches, the Gear S2 runs on Tizen OS, however, it will be compatible with any Android smartphone running Android 4.4 or later, with at least 1.5GB RAM.



Huawei Mate S

This 5.5-inch smartphone announced their with Smart-pressure Sensitive Screen just before Apple did for their latest iPhone 6s's 3D Touch, making it the only other maker out there with a pressure-sensitive touchscreen that delivers different functions with different taps and presses. You can experience its fairly intuitive Emotion UI 3.1 – effectively a re-skin of the Android 5.1 OS (Lollipop) – via a Full-HD (1,920 x 1,080 pixels) AMOLED screen. It also comes with Fingerprint Sense 2.0, which has supposedly twice the speed of the previous version, and the Knuckle Sense 2.0, which is effectively smartphone control via gestures and drawing on the phone.



Razer Diamondback

A cult favorite makes a return with the 2015 edition of the classic Razer Diamondback. First released back in 2004 – yes, it has been over 10 years! – the Diamondback has been high impossible to find for quite a number of years now. So imagine our excitement when we learned that Razer was resurrecting the mouse, complete with innards updated for 2015. It now features a 16,000DPI 5G laser sensor, and because Razer is on a mission to ensure you have color-coordinated hardware in all colors of the rainbow, the side rails and scroll wheel now come with Chroma lighting. It retains its long, slim ambidextrous form factor, with two programmable side buttons on both sides of the mouse. Rubber grips have also been added to the sides, which mean a better grip and less build-up of dirt and grime.

PICTURES SAMSUNG, HUAWEI, MOTOROLA, RAZER, ASUS AND SONY

ASUS ROG GX700

It's not often that we see something completely new and bonkers, so imagine our excitement when the new ASUS ROG GX700 notebook rolled up at IFA 2015. Its ROG line is all about the absolute cutting-edge of technology and the new ROG GX700 lives up its name because it is the world's first liquid-cooled notebook.

The liquid-cooling module is detachable, so you do not need it to work. And when detached, the ROG GX700 becomes a somewhat portable 17-inch gaming notebook. However, hardcore gamers would certainly want that liquid-cooling module because ASUS claims that it can boost performance by as much as 80%.

Other details that we know now is the 17-inch display will support 4K resolution and that the machine is powered by a high-end Intel Core i7-6820HK processor and a new mobile and yet to be announced mobile GPU by NVIDIA that features 2,048 cores. By comparison, the current flagship mobile GPU, the GeForce GTX 980M, has 1,536 cores. Looks like the ROG GX700 will be an absolute beast.



Sony Xperia Z5 Premium

Sony decided to squeeze a powerful 4K display with a resolution of 3,840 x 2,160 pixels on a 5.5-inch flagship-level smartphone. Topping it off is a premium chrome finish that's reflective enough to be a mirror, and a power button that doubles as a fingerprint sensor. It does seem intimidating to the naked eye and to our wallets, even if a 4K screen in your pocket is not practical – yet. If the Z5 Premium is too over-the-top for your taste, Sony also has the Z5 and Z5 Compact – with 5.2-inch Full HD and 4.6-inch HD screens respectively. Just like the Xperia Z smartphones that precede this lineup, Z5 devices promise waterproofing and powerful camerawork with a brand new large 1/2.3-inch Exmor RSTM for mobile sensor with 23-megapixel resolution and f/2.0 G Lens.



ASUS RT-AC5300 Wireless-AC5300 Tri-Band Gigabit Router

While camera manufacturers duke out over sensor sizes and megapixels counts, router manufacturers are trying to outdo each other with more external antennas. And the router that is currently sitting on the throne of antennas is the new RT-AC5300 tri-band router from ASUS. It has eight antennas! Now let that fact soak that in for a while. Eight antennas aside, it also has a body that looks more like a spaceship. Taken as a whole, the new RT-AC5300 router does look like some piece of weird alien technology.

However, what the RT-AC5300 router really is a tri-band router that supports a maximum combined data transfer rate of 5,300Mbps. How is this number derived? Thanks to Broadcom's new NitroQAM technology, total throughput on the single 2.4GHz band is now 1,000Mbps, whereas each 5GHz band can support up to 2,167Mbps. Add it all up and you get 5,334Mbps.



LG 4K HDR OLED TVs

For many content and TV makers, the next big thing after 4K is HDR (high dynamic range). At IFA 2015, Samsung and Sony have committed to bring HDR support to all their 2015 4K LCD models though upcoming firmware updates. But HDR will truly shine on OLED TVs, as OLED tech has the capability to render the required HDR light range better than LCD. LG's EF9500 and EF9200 are the company's first 4K OLED TVs to support HDR right out of the box. These TVs are able to render HDR content from streaming services (e.g. Amazon Prime Video) as well as external sources (e.g. UHD Blu-ray players). The only non-LG 4K HDR-enabled OLED TV on the horizon is Panasonic's CZ950.




Sphero BB-8 droid



Star Wars fans, here's something to tie you over till the December release of *The Force Awakens*. First spotted in Disney's first trailer for Episode VII, BB-8 is a rotund, rolling droid that resembles that other fan favorite droid with a dome-shaped head — R2-D2. The Sphero BB-8 is a miniaturized version of the adorable ball-shaped droid, and it's more than just a prop. At its core is the Sphero robot ball, a self-balancing ball driven by an internal gyroscope. Without going into the details, the head interfaces with the body with the help of magnets, and it's designed such that the droid always knows which way is forward. The droid can even recognize and respond to your voice, and you can control it remotely via a smartphone app or even program a route for it! It's also capable of autonomous behavior, so you can explore the universe together with a ball-shaped buddy.

REAL-LIFE SPIDER-MAN: SUPER-SILK

by Koh Wanzi

 Your friendly neighborhood Spider-Man may not be real, but his super-strong web might just be. Scientists at the University of Trento in Italy still don't know how to give you the powers of everyone's favorite web slinger, but they could just be on the path to the next best thing.

The researchers found a way to get spiders to weave webs infused with carbon nanotubes and graphene, and the result was spider silk that exceeds even the toughest knotted fibers in strength.

They did this by spraying five spiders from the Pholcidae family with a mixture of water and graphene particles 200nm to 300nm wide. Graphene consists of sheets of carbon just one atom thick. It is also one of the strongest artificial materials, which makes it apt that it would be combined with spider silk, one of the strongest natural materials.

Another ten spiders were also sprayed

with carbon nanotubes and water to compare the effects of the two materials.

While the results were not always positive, but some spiders received a major boost in web strength. The giant riverine orb spider that was dosed with nanotubes came out on top, and its silk was around 3.5 times as tough and strong as the best unaltered silk.

The process by which the spiders incorporate the new materials into their silk is still unclear, but one theory is that the spiders absorb the materials in their environment and weave it into their silk. And seeing that four of the spiders died soon after being sprayed, this certainly looks to be a possible explanation.

But while the technique is far from complete and it's not yet clear how such super-silk could be used, the researchers already think it could make previously implausible constructs a reality in the future, such as constructing a giant net capable of catching falling aircraft.

ARE WE READY FOR CONNECTED CARS?

The modern automobile is incredibly smart. It can connect to the web to stream entertainment content, traffic information and more. Some are so intelligent they can perform self-diagnostics without needing to go to the workshop. But are we ready for them?

by *Kenny Yeo*



In today's fast pace and increasingly connected world, we demand everything to be online. The first were our computers, then our phones and now it seems that there's a need for connected versions of everything. If you look around, you can even find a smart flowerpot that can learn when is the best time to water its plant. And since research tells us that we are spending more time stuck in our cars than ever, it makes sense to have connected cars too.

On the most basic level, cars that can connect to the internet can have a much wider selection of entertainment options, through music streaming apps or online radio stations. On a more advanced level, some are able to quickly alert emergency services should an accident occur; they can even transmit preliminary accident reports and notify relevant specialists about the type of accident and what kind of help needs to be rendered. Needless to say, such connected cars are make day-to-day living more pleasant and are also safer to drive.

However, being connected brings about a set of new problems, especially with the recent spate of digital security breaches and

hacks, and cars are no exception it seems.

In late July, a report surfaced that documented how a Jeep Cherokee could be hacked. A pair of hackers, Charlie Miller and Chris Valasek, sent commands to a test vehicle - a 2014 Jeep

"A pair of hackers, Charlie Miller and Chris Valasek, sent commands to a test vehicle - a 2014 Jeep Cherokee - to demonstrate a program they developed that would allow them to remotely control the vehicle."

Cherokee - to demonstrate a program they developed that would allow them to remotely control the vehicle. In a video showcasing their hack, they fiddled with the air-conditioning, blasted the in-car entertainment system and also turned on the wipers, all while seated miles away from the car in the comfort of their home. On a more serious note, they also showed that they could control the car's steering, kill the engine and even disable the brakes.

Not long after, researchers at the University of California in San Diego also demonstrated how they could remotely hack a 2013 Chevrolet Corvette via a

connected insurance dongle. This dongle is designed for used by insurance companies and trucking fleets to monitor a vehicle's location, speed and efficiency. The researchers found that by sending SMS messages to these dongles, they could transmit commands



to the car's CAN bus and remotely control the car. The CAN bus is an internal network that is used to control a car's physical driving components. Stefan Savage, the computer security professor who led the project at the university, gave a damning verdict about his findings and said that these dongles provided multiple ways in which hackers can use to remotely control just about anything on vehicles.

Now, ever since the first Model T rolled out from the Ford Factories, automakers have been obsessed with security, but of a different kind. Thanks to inventions like the seat belt, air bags, anti-lock brakes, crumple zones and side impact beams, cars have never been safer than they are today. A recent test showed that in a head-on collision at similar speeds, a Renault Modus supermini with a 5-star NCAP rating will actually fare better than a large Volvo 944 Estate, even if the latter was about 500kg heavier.

However, it's time for automakers start to focus on a different type of security – cyber security. The problem, it seems, is automaker's inexperience in the workings of the cyber world and their naivety when it comes to security protocols.

Security researcher Samy Kamkar recently demonstrated a bug in GM's OnStar service that would allow a hacker to impersonate as an owner and gain access to the car. He also said that this bug could possibly work also for BMW and Mercedes-Benz cars. "Some of the things that I'm finding are not crazy. I'm finding very common vulnerabilities that have been known about for at least a decade in the

cyber security world," Kamkar said. More worryingly, he also stated that security researchers are only scratching the surface of what is possible.

Fortunately, there's a glimmer of light at the end of the tunnel. Some automakers and companies have recognized that more needs to be done. Chrysler, the parent company of Jeep, quickly issued a recall of 1.4 million vehicles after Miller and Valasek alerted them of their cars' vulnerability. Metromile, the insurance company involved in the insurance dongle hack described earlier, also swiftly released a security patch to all of its devices after learning about the hack. Metromile CEO Dan Preston also said, "We took this very seriously as soon as we found out."

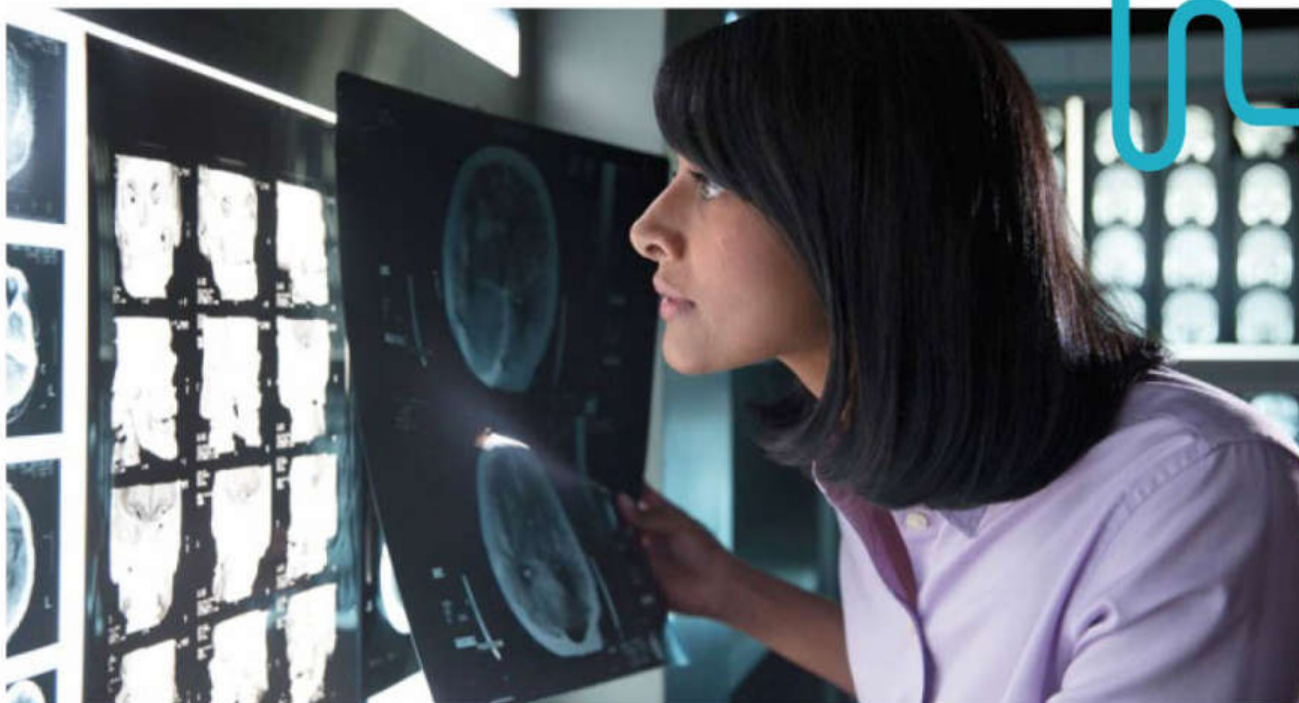
Others, however, are reluctant to admit that there's a problem. A spokesperson from Mercedes-Benz, for instance, wrote in response to Kamkar's claims that the company does not wish to "engage in speculation about potential hacks (often the result of extreme manipulation) that have very little likelihood of occurring in the real world and create unnecessary concern."

Cyber security surround connected cars was a top topic at this year's DEF CON hacking conference, and security researchers all agreed that more needs to be done to make connected cars more secure. However, that would require the cooperation of automakers. As for now, the next time you are buying a car, better think twice before ticking that option box for that internet-connect in-car entertainment system.

EMULATING THE LIVING BRAIN

Superintelligent AI? Machines will first have to learn how to emulate the structures of the living brain.

by Koh Wanzi



Futurists would have you believe that artificial intelligence could one day transcend our own in an event that you've probably heard referred to as the technological singularity. So are our biological intelligences condemned to eventually languish in the shadow of the machine?

Not quite.

Developments in machine intelligence are actually subject to two almost paradoxical crosscurrents. While the machine could eventually surpass the human, the burgeoning field of deep learning and artificial neural networks is showing that in order for computers to become smarter, they could first take a few lessons from nature.

Running off GPUs

At the forefront of it all is a handful of GPU-accelerated technologies that use the power of GPUs' massive parallel architectures to process multiple tasks simultaneously and more efficiently, and also run compute-intensive deep learning algorithms. NVIDIA's own DIGITS ecosystem provides data scientists and researchers who want to train their own algorithms and neural networks with a way to do so easily, even without any technical knowledge pertaining to GPUs.

Deep learning was also the focus of the Asia South leg of the NVIDIA GPU Technology Conference (GTC) 2015, where Marc Hamilton, VP, Solution Architecture, at NVIDIA spoke of various real-world applications for deep learning algorithms. One particularly exciting use would be in automated driving systems, where self-driving cars could respond to changing road conditions on-the-fly,



The NVIDIA DIGITS DevBox is powered by four Titan X GPUs, providing developers with ready-made hardware to advance the field of deep learning.

instead of being programmed to respond according to a rigid set of parameters.

So if conditions deviate from the norm – perhaps when road markings are obscured by snow or traffic lights are blocked by tree branches – these cars will still know how to respond correctly. The hilarious report about a particular Google autonomous car's reaction to a cyclist doing a track stand at a traffic intersection also shows just how much self-driving cars could benefit from the ability to react to new and unexpected situations.

However, these neural networks need to be trained and fed huge amounts of data in order to become smarter. But because they learn from matching similar patterns to each other, instead of recognizing

specific characteristics, they can learn to respond to new scenarios. Think of it this way. Confronted with a new picture of a cat, a pre-programmed machine would flounder, but a machine powered by deep learning algorithms would recognize common patterns from previous pictures of cats it had seen before, and be able to identify the picture.

Neuromorphic Chips

GPUs are also far from the only way to run these neural network algorithms. Back in 2014, IBM unveiled its latest chip, a piece of silicon inspired by the human brain, as part of DARPA's SYNAPSE program. IBM wanted to create a chip that could excel at things computers were traditionally bad at, but which humans could do effortlessly – pattern recognition and the processing of images, sound, and sensory data. So while GPUs are capable of handling brain-inspired deep learning algorithms, the SYNAPSE chip attempted to emulate the brain's architecture, together with its dense network of neurons and synapses, from the hardware up.

This year, IBM showcased a new application for the chip, now dubbed TrueNorth. It had integrated 48 of these chips into a single system to mimic a 48-million neuron rodent brain, creating an exceedingly efficient way of executing neural networks. Because it

emulates neural networks in much the same way as deep learning algorithms, the two map very effectively onto each other.

Democratizing Deep Learning

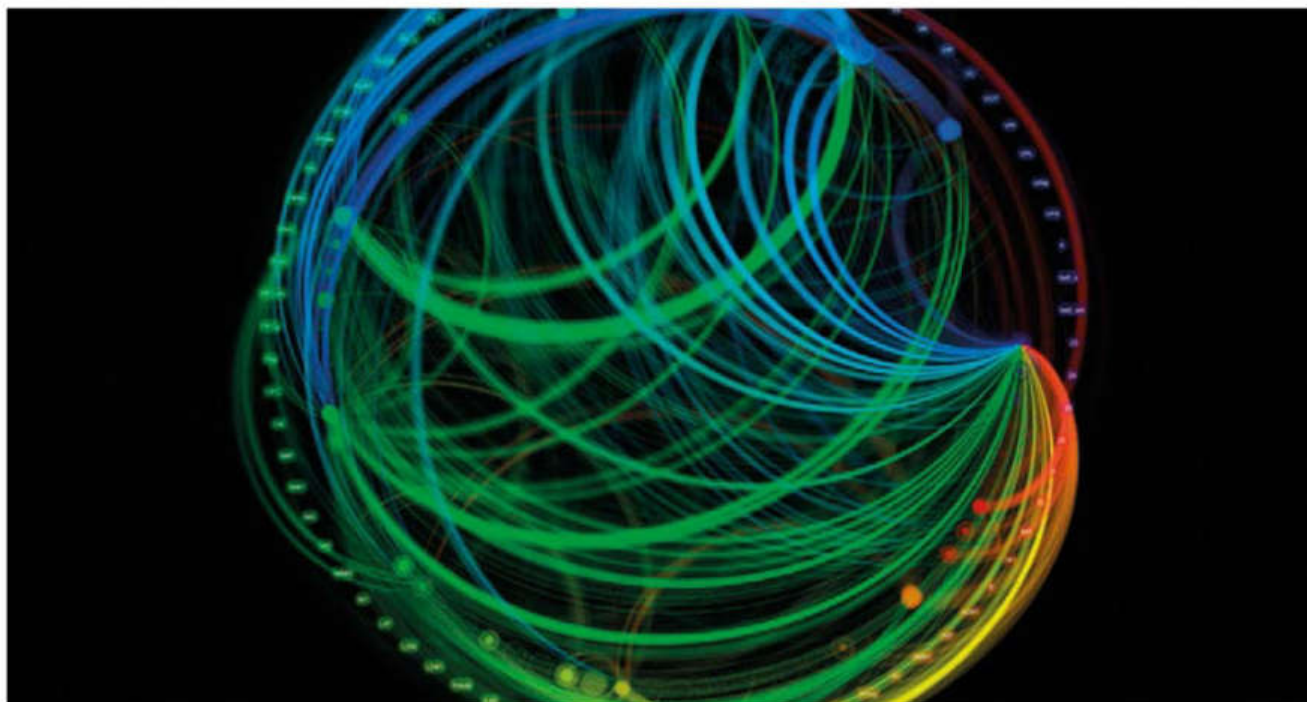
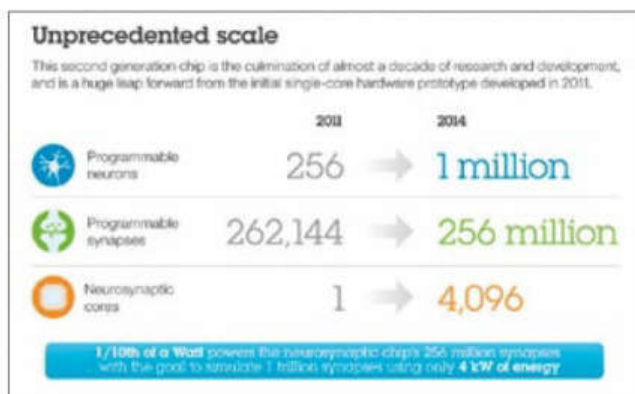
And then there are startups like Nervana, which offers deep learning on its custom hardware as a cloud service. By making deep learning capabilities more accessible, it hopes to spur the democratization of deep learning for an even wider variety of applications. It is not alone in this goal, and outfits like Ersatz Labs, MetaMind, and Skymind all want to enable a broader adoption of the technology.

Nervana CEO and co-founder Naveen Rao believes that medicine could be one of the fields that will see the most benefit from the improved ability of computers to recognize patterns and images. For all the advances in medical science, the interpretation of scans like X-Rays and MRIs are still left up to doctors themselves, which means that human error could very well find its way into crucial diagnoses. Rao thinks that deep learning could make it possible to apply decades of expertise to a computer, and help less experienced doctors minimize their own errors.

A more specific application would be in the case of diabetic retinopathy (DR), an eye disease that is a leading cause of vision impairment in diabetics. Detecting DR is a tedious and time-consuming process that requires doctors to closely examine digital photographs of patients' retinas. Furthermore, the resources and expertise required for accurate diagnoses are often lacking in areas where diabetes is prevalent, which means a reliable method to automate the process is sorely needed.

Kaggle, a platform for data prediction competitions, ended up hosting a contest for quicker and more accurate detection. The results were promising, as all top five entries turned out results that were more accurate than human doctors, the latter's accuracy being determined as the rate of agreement among three clinicians.

To sum things up, before artificial intelligence can even surpass ours, it must first take a leaf from our book (or rather, our craniums). HAL 9000 may be a long way off, but fragments of its precursors are already driving advances in areas as varied as consumer technology and medicine.



Neural pathways of a macaque brain as simulated by TrueNorth.



PICTURE APPLE



LUXURIOUS CRAFTSMANSHIP OR A NECESSARY NOVELTY?

A month on the wrist: The Apple Watch through the eyes of a mechanical watch lover.

by Kenny Yeo

There are two types of people in this world: people who wear watches and people who don't.

If you belong to the second group, then there is really no reason why you should get an Apple Watch. Unlike a smartphone, desktop or a notebook, a smartwatch is not a necessity. You don't need a smartwatch to take calls, browse the web or check your emails. In fact, smartwatches are still heavily dependent on the phone that they are synced with for features. Take the Apple Watch away from the iPhone and it can do little more than tell the time. If you have made it this far in life without a watch on your wrist, you'll do fine without an Apple Watch.

However, if you are like me and you love watches and have a habit of wearing them no matter where you go, then the Apple Watch is a tasty prospect that's worth some consideration.

To begin, the Apple Watch is the best smartwatch for the iPhone. No other smart watch works as seamlessly, but whether it is necessary or even useful depends very much on your own habits. Personally, I found some features to be useful, but conversely, I didn't find that I was missing anything when I wasn't wearing my Apple Watch.

So whether the Apple Watch is useful is debatable. What isn't debatable is Apple's attention to detail and the build quality of the watch. For a brand with zero experience in making timepieces, the Apple Watch is one hell of a watch.

The quick strap change system is a breeze to use and makes it extremely easy for users to change straps. The straps from Apple themselves are also brilliant. The metal bracelets, for instance, are wonderfully easy to size, requiring zero tools whatsoever. And the Milanese loop, which is my favorite, has a magnetic clasp that makes it so easy to get a perfect fit on the wrist.

The stainless case of the Apple Watch is also impressively made and finished. Admittedly, mirror polishing the entire case is not the most complicated thing in the world, but the overall quality of the case is very high. Put the Apple Watch beside a watch costing twice or thrice as much and it would not seem out of place. It looks and feels like a proper luxury watch.

I thoroughly applaud Apple for its efforts. The Apple Watch simply blows away the current smartwatch competition insofar as build quality is concerned. But

as an alternative to traditional mechanical timepieces, I have my reservations.

One of the reasons why I love mechanical watches so much is their longevity. If taken care of properly, a mechanical watch can last decades. This is the exact opposite of gadgets that will go obsolete in a couple of years. It is impossible to expect that the Apple Watch of 2015 to be compatible with the iPhone whatever of 2025. Ten years from now, what you will be left with is a very well made digital watch, which isn't really that bad.

But therein is the problem, the Apple Watch will surely fail at some point too. Its rechargeable battery will gradually lose its ability to hold its charge and will need to be replaced. Apple might be able to get you a replacement battery perhaps 3 or even 6 years from now, but it is unlikely to be able to do so in 10. I doubt Apple is safekeeping first-generation Apple Watch batteries in their storeroom in anticipation of customers returning a decade later in search of a replacement.

As for mechanical watches, thanks to advances in materials and manufacturing, a typical mechanical watch can last decades if used appropriately and serviced regularly. And even if it does break say 10 or even 30, 50 years down the road, most brands and or even skilled third-party watchmakers will be able to carry out repairs for you. In fact, many luxury brands pride themselves on their ability to service and restore customer watches even if they have been long out of production.

That's my biggest gripe with the Apple Watch, and it is the same for all digital and quartz watches. I admire their unique designs and cool features, but I would be reluctant to spend past a certain amount for one only because I know it will become impossible to repair one day.

As I mentioned previously, watch wearers buy and wear watches because of the way it looks and the way it makes them feel, and I'm happy and proud to wear the Apple Watch around my wrist. After all, it's fantastically made and does provide some real utility.

That said, I would be hesitant to recommend it as a purchase, because its usefulness is highly subjective and also because I know it would become obsolete. But if that doesn't bother you, the Apple Watch is not just the best smartwatch for the iPhone, it is also one of the best digital watches you can buy, period.

"What isn't debatable is Apple's attention to detail and the build quality of the watch. For a brand with zero experience in making timepieces, the Apple Watch is one hell of a watch."

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business.”



Managing the keys to your kingdom

JOHN WORRALL,
CHIEF MARKETING OFFICER, CYBERARK
SOFTWARE INC

by James Lu

Let's start at the top. What are privileged accounts?

Privileged accounts are the "keys to the IT kingdom".

Whoever has control of these keys has access to that device or that particular part of the network. Every device that has an IP address has a privileged account, and that's what used to deploy and manage that piece of technology. So it has all the power to turn a device on, turn off; decide who gets in, how the device is deployed. In the hands of a trusted individual, it works exactly the way it's supposed to, but in the hands of the attacker, it's devastating, because whoever controls the privileged accounts actually controls your business.

The challenges consumers face are almost identical to challenges security administrators face, which is the classic: "I have to have a password, I want it to be secure, but I want to make it easy to remember." That's a really hard thing to do.

But with everything being more inter-related, how do I know that I can trust my passwords and the services I use?

I'd say it comes down to "trust". The organizations you deal with all need to have some internal solutions to deal with their security systems and passwords. As a consumer, you don't have enough information to know what they're doing, and even if they explained it, you probably wouldn't understand half of it. So, basic practices to do are:

Keep your passwords in a secure place.

If you want to write them down, that's great but don't just leave them lying around. Keep them in a locked drawer or somewhere that no one else is able to get to.

One of the key ideas in enterprises is to segment credentials so no one

password gives access to everything.

Do the same thing with your own accounts. If it's low value, assign it one password. If it's something more important to me, where money is involved? I'm going to treat those very differently. I'm going to make them longer, more complex, and I'm going to change them on a regular basis.

It really is taking responsibility for your own security as best you can. If given the option for 2 Factor Authentication (2FA), take advantage of it.

How safe is 2-Factor Authentication? Is it enough in a sense?

It's better, but it's not perfect either. That's why it's all about "how much security is appropriate for what I'm trying to protect". If they're going after a million people at the same time, then the chances of them getting both my credentials and the 2FA is minimal, so that's really great security there. But if they're going after me personally and they're really determined, they'll figure something out.

The other thing to remember; is that you can always ask your bank if they offer real-time fraud detection for your accounts. A lot of them do, and they've got software that can do time/distance analysis so if you use your card in Boston today and in an hour's time a charge pops up from Singapore, they can shut the card down.

But we also tend to give a lot of information away don't we? For example when we fill in those forms for lucky draws...

Personally, I think that as individuals we are so free to give up so much information about ourselves for so little in return. My experience is that the older generation doesn't trust technology at all. My mother

would always go to the bank to do a withdrawal because it "doesn't feel right" to use an ATM. My own kids? They'll share anything. We ask them "Why did you just share the fact that XYZ?" and they'll reply with "Why wouldn't I?"

It's just a very different mindset. There's this blind faith that "nothing's going to happen to me and that the technology will be fine". But there are people out there just waiting to get your information so we have to be careful with how much of our information we put out there.

Is there a general rule of thumb for how to create a secure password?

The basics are complexity, length, and the frequency of how often you change it.

If it's easy to remember, chances are it's not very secure. Eight characters should be minimum. Also use a mix of characters, upper and lower case, use numbers; use special characters. And then change them frequently. Those are the general rules.

Will there ever be an alternative to the password then?

I've been in the password business since 1977, and that question has come up ever since, but I don't know how passwords (can) actually get replaced. I know that you can hide them, and that's what we're doing, and biometrics is coming up. That's more of a convenience piece, but it's not unhackable either because ultimately you still need to store a reference image somewhere so that can be captured.

The actual challenge with replacing the password is that every piece of infrastructure relies on it right now. Think of the massive task of rewriting every single application. How many decades would it take to actually get it implemented to where there's critical mass to get it to work? It's a daunting challenge.



It is my hope that with Present, I can help children remember the people they have lost, be it a parent, sibling or a friend. I hope this will help them to feel less alone in the world.



Everyday should be a gift

PETER DRAW,
FOUNDER AND CEO OF PRESENT

by *James Lu*

You have an interesting surname. What's the story behind that?

I'm an artist. Actually my real name is Peter Zhuo, but kids always call me Peter Draw, so I just went with it. I started out when I was 16 by drawing portraits on the street for free. I started getting better and then I started working for events companies. I was charging \$10/hour at the start, but at my peak I was earning \$2,000/hour at big corporate events churning out portraits every 30 seconds.

What is Present?

The idea for Present was born when I visited Costa Rica. I met a young girl who had lost her mother in an earthquake. She said that she felt alone because there was nobody to celebrate her birthday, and that her home felt empty as if there was nobody there. Meeting her sparked the idea of Present as a way of capturing memories of your loved ones, so you can hold onto them forever. So Present is an app where you'll see a lot of babies, a lot of first memories. And also a lot of old people, a lot of last memories. Present is about reminding people about life and death and treasuring everything in between by saving and sharing those precious and fleeting memories.

What makes Present different from other video recording apps and social media platforms?

Our app is very simple to use. You

don't need to press a button to record. As soon as the app launches it starts recording instantly. You press the red button to stop recording. You can also edit footage, skip around the video, add music from millions of songs in the iTunes library to it – they're only 30 second clips, so there's no licensing issues – filters and other effects.

We also want to give people unlimited storage, to let them store as much of their precious memories as they want, forever, for free. We're working towards higher and higher video quality so that the memories captured are as real as possible.

If you look at Facebook or YouTube or Google, there's a lot of other content on it. We want Present to just be for people's most precious memories, so you'll be able to search and discover videos that mean something.

It is my hope that with Present, I can help children, like the girl I met in Costa Rica, remember the people they have lost, be it a parent, sibling or a friend. I hope this will help them to feel less alone in the world, and that, in turn will spur them on to achieve great things in life.

How are you planning on giving people unlimited storage? Is Present free to use?

Yes, Present is completely free to use. We'll take care of the costs for storage. I don't have all the answers, but along the way, we'll figure out how it's all going to work. I'm not

going to be the CEO that tells you I have everything figured out, but right now, our objective is to deliver the best value for the people we're doing this for, like mothers who want to capture their baby's first moments.

Will you be offering premium services or other paid-for features?

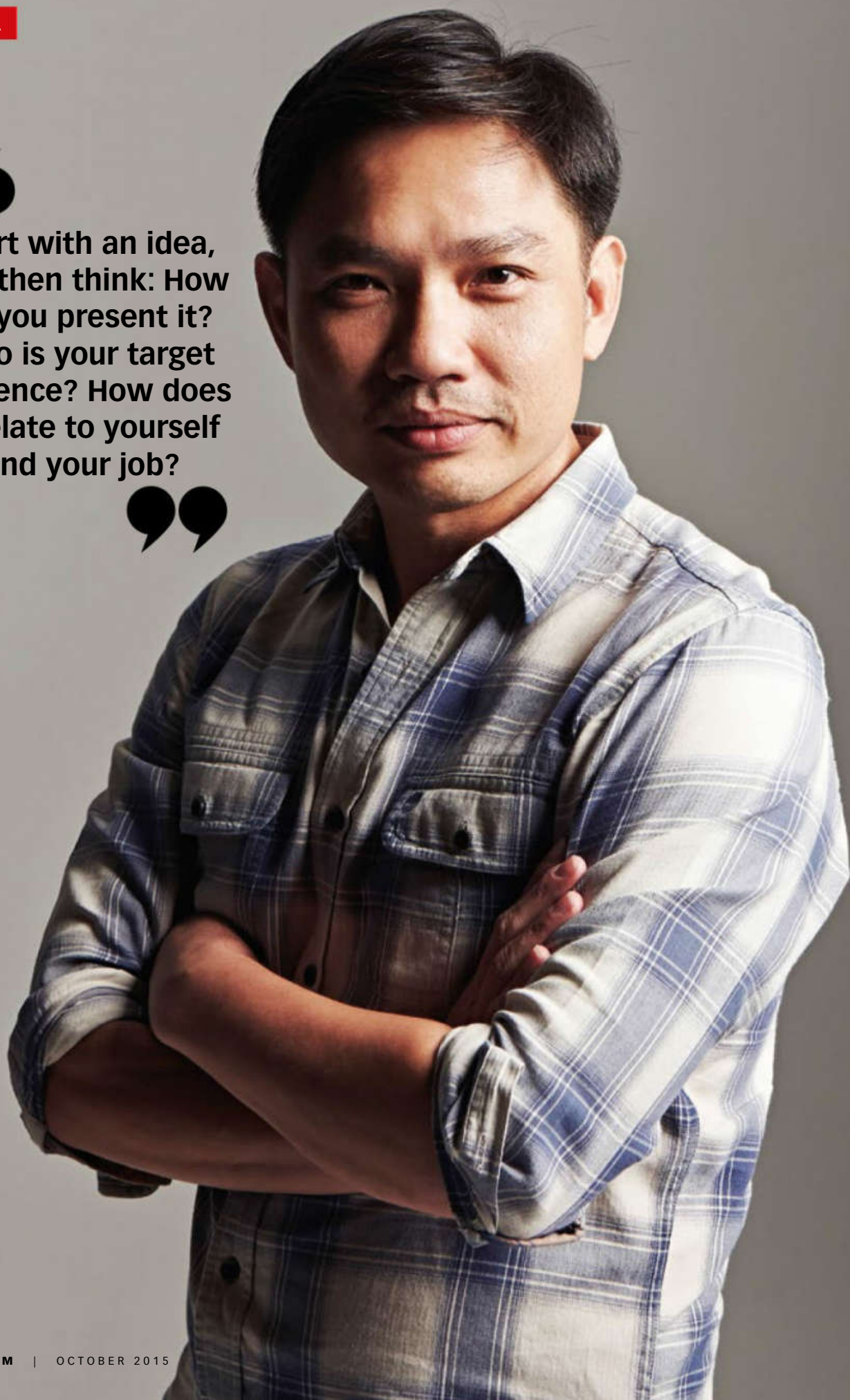
Once we are able to, we do want to start offering premium services. For example, we imagine that soon a lot of wedding videographers won't need to buy very expensive cameras, and in the future anybody with a smartphone and Present premium features can be a videographer and can create a part time job for yourself at a wedding or a birthday party. We're creating jobs for people.

By offering a free high-quality video recording app, and unlimited high-quality storage, are you worried that people will start using Present for everyday mundane videos, diluting the app's philosophy of storing life's precious memories?

I believe that everyone defines what memories are precious to them in their own way. To some people, that could be their childhood memories, elderly's last birthdays, right to vlog, beauty moments of their youth, crazy experiences with their friends, singing at home, or food videos. I'll take a step back and allow users to define their own precious memories and let them find their own special way with Present.



**Start with an idea,
and then think: How
do you present it?
Who is your target
audience? How does
it relate to yourself
and your job?**



Bridging time and space through images

KIM LAU,
PHOTOGRAPHER AND PRODUCER,
LANDS FROM THE MONGOL EMPIRETY

by *Marcus Wong*

What led you to hold an exhibition of your work?

I'd already been compiling a lot of images over the last seven or eight years. I started off with having an interest in the Silk Road, and then after that I expanded to West Asia. My research showed that the Mongols were in just about every location I went to, so I thought: I'll just use this common theme and put everything in. But when I started this proper, I found that a lot of things were lacking, so I decided to take time off from work, get some sponsorships, and go compile some images using history to link them.

What made you go from just taking pictures to exhibiting them?

Well actually from the start, photography was not the main focus. It was the quest of the experience. Photography became a tool for sharing, and something that really helped me in my journey because when I try to photograph people, they give me an opportunity to be closer, and I got a chance to stay longer with them in general.

I see. But how did you approach these people to begin with?

How to approach people? You have to spend time; because without time you can't get to the place that you need, and you can't get to the people that you need to meet. Of course, there's quite a bit of research too.

I imagine you can't just turn up and start taking pictures?

Oh yes. That becomes quite difficult. It doesn't mean that I can't show up and just do, but a lot of times you will not get the things that you need. Sometimes you need people to help, but sometimes you just do it; especially when you have more

help in terms of communication. You just need to spend more time. Festivals are great opportunities for photographs for example, because usually people are up for pictures at festivals.

Otherwise, a market scene is good too. If you're there long enough, things will go on, they will forget about you, and they will be okay to let you take photographs as well. It really depends on the country as well, but when you start to build contacts you can get passed from one person to another, and that brings you to different places. You also need to know the local characteristics. Women for example, are still quite forbidden. You can take a photograph with the proper permission, but in some cases it's easier if you have another woman to do it.

What were the biggest challenges you faced while you were out getting images for this project?

If you're talking about landscapes, then it's "time". Finding the time and working around boundaries. Because you need to go high; you need to go low. Sometimes you have to break the rules a little bit. Go around to places where you're not supposed to be and so on. Landscape photography is really about time.

Portraits are harder. It doesn't always work out the way you want it to. People photography is about contacts. So you need a fixer to do the job. And that means making contacts. When you're out there you have to work by the mode of "whatever works for you". For example, in the Tuva Republic, the place was difficult to navigate because it's dangerous and very expensive since they normally only get diplomatic travelers. So, I

was forced to go to someone who commonly handles foreign media.

Sometimes, that's the only option. Either you pay your way through; or you give up the option. But sometimes, (even if) you pay the money, it doesn't work out.

How do you decide what to pack then?

You can never have enough gear. Of course you want to have everything with you, but you can't carry! A lot of times if you know what you're doing, you can get around your equipment. I find that equipment is nice to have, but beyond the basics, you have to ask yourself: Do I really need this? Am I willing to carry it?

Having a photography exhibition of your own can seem like a daunting task. Where does one even begin?

You have to work on a subject. If you want to create an exhibition with meaning I think you need to work on a particular subject, which is more like photojournalism. But of course there are many other kinds of exhibitions as well, but you still need a topic. Without a topic, how can you put things together?

Start with an idea, and then think: How do you present it? Who is your target audience? How does it relate to yourself and your job?

The topic can always evolve. My own exhibitions have evolved because I'm still reading and learning, so my ideas of what to do with the pictures and stories are changing too.

Great. Finally, what's the main lesson you've learnt from all your travels?

Stay safe and stay healthy. You can't take it for granted because you're in a harsh environment. Everything else is not important.



FEATURE

The Apple Music Offensive

Launched by Jimmy Iovine with a personal endorsement from Canadian rapper Drake, and a free trial to boot, Apple Music has certainly made lots of noise as the newest entry to the music streaming industry. But with the three-month trial period ending for most of its initial subscribers, has Apple Music made any real innovation to the streaming formula?

Text by *Marcus Wong*

Illustration by www.skullbase.blogspot.com

Art Direction by *Ken Koh*



Apple Music seems to be taking on all corners at once with its approach to having discovery, artist sharing and everyday listening from the one app. That's an ambitious task...

The music streaming industry is already fairly mature with Deezer, Spotify and Tidal among the main players who have stood out, and Apple Music seems to be taking on all corners at once with its approach to having discovery, artiste sharing and everyday listening from the one app. That's an ambitious task, and the over-reaching approach has definitely contributed to some of the complaints we've got from early users.

Let's take a look at the four new sections added to iTunes that specifically make up Apple Music: For You, New, Radio and Connect, to find out what exactly the service is bringing.

For You... sort of

The bread and butter of any music streaming service, this is what makes Spotify stand out from the rest, as their Discover panel presents you recommendations sorted by playlists, albums and songs respectively. It's orderly and efficient, and you can easily look for new music by scrolling through the various recommendations.

In contrast, Apple Music also presents playlists with album recommendations but mixes them together so it can be quite a bit to scroll through if you're looking for a particular album/playlist. New suggestions seem to be added every day, and we do think the suggestions are good, but it is evident this section needs better organization, because this is where the Apple Music experience is supposed to begin proper.

It also isn't immediately obvious how to add or remove artists to your mix. We had a Hacken Lee playlist recommended for us because we "liked" Hacken Lee by mistake during the start-up process, and we haven't quite found a way to remove it. Selecting to "Recommend Less like this" doesn't remove the playlist, though at least there haven't been any other recommendations from him since.

New is cool

New is where all discovery actually happens, and we'd say it's probably one of the strengths of Apple Music as it brings songs, playlists, albums, charts for both tracks and music videos all in one place. Like a particular album or song enough;

and you can just pop three tabs down to the iTunes store to pick it up (or even the entire album!). It's also here that you can catch audio and video items that you might otherwise have missed. It's here that we found a couple of the interviews done on Beats 1, giving us a taste of the potential of the station.

One thing we'd pick on though is the length of the playlists. Each playlist only lasts an average of about an hour, without ready suggestions on what next to add. Unlike 8tracks, there's no sidebar to recommend other playlists of music from a similar genre, so the experience halts once the playlist ends.

Sure, you can queue up items to the Up Next queue, which seems to be permanent until you manually clear it, but the icon for the queue itself is fairly tiny, which means most users will probably miss it. Like some other reviewers have mentioned, we do wish that relevant user playlists would pop up in suggestions for you too, as that would certainly bring more variety.

That's arguably one of the greater strengths of Spotify and Deezer, and it's an omission that's especially glaring given how Apple claims to understand the social nature of music.

Radio has been shut down

The next tab is Radio. If you recall, the promise was that Apple Music would be providing 24-hour live radio worldwide by way of three stations in Los Angeles, New York and London. If that wasn't enough, the station also promised exclusive interviews with artists and the option to easily add tracks to your Apple Music library or to directly purchase from the iTunes Store.

Tip!

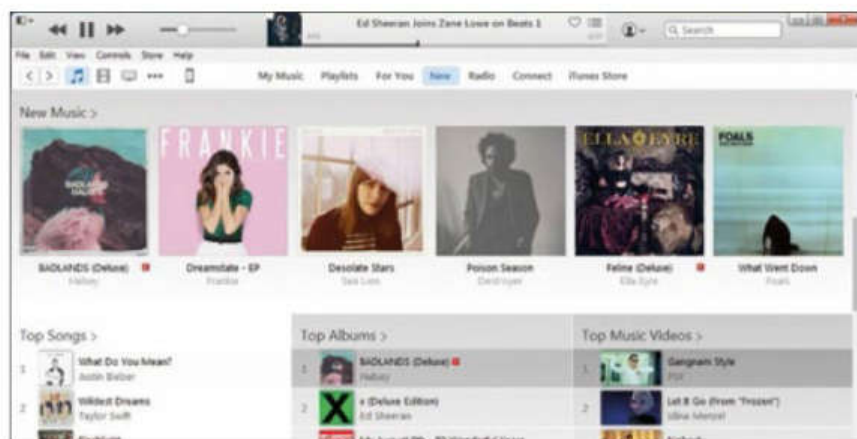
To add new artists to your mix, you can either readjust your selections by going up to your profile and clicking "Choose Artists for You" to start the process again, or by clicking on the heart next to any track to indicate that you like that type of music.



The early set-up process is always important.



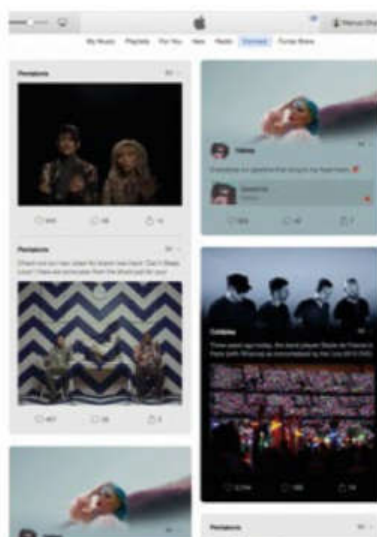
The For You tab can get fairly confusing as it grows.



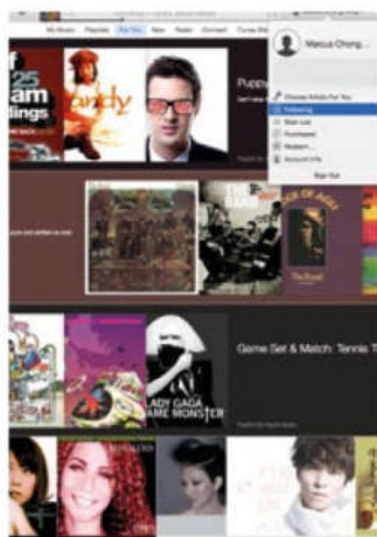
New is where Apple Music should have advantage.

Tip!

One way to find out which artist is active in posting to Connect is to click on their name repeatedly to get to their profile page. If the artist has posted to Connect, there will be a "Connect" tab next to "All", which shows all his posts. That should give you an idea of how often you can expect to see new updates.



Connect has lots of potential if the artists get active on it.



Restart the music selection process from your profile settings.

From what we see online (and via podcasts recordings) artists are also periodically invited to "guest" DJ, so that brings another element in which you can potentially have your favorite singer take you through an afternoon with their favorite tunes.

This would be something the competition doesn't offer as yet, and it all sounds well and good, but despite being available in close to 100 countries, Beats 1 Radio still isn't streaming to Singapore for some reason. Given how much fanfare there was about it being a 24-hour worldwide service, we're hoping that this gets fixed soon enough. Without it, there are only playlists, which are really no different from any other streaming services.

Connect is where it's at

This is where Apple Music should really stand out. The Connect section brings you a wall of Instagram/Tumblr type posts from the artists you follow, and this can be anything from their chosen song of the day, to short video clips or songs or just images. Artists are also allowed to post links so you sometimes get directed to Twitter or Periscope feeds as well, making it truly flexible.

How interesting your feed is depends largely on who you follow as the artists obviously all have their own posting habits. Adding artists to your Connect page can be a little confusing though, as despite the fact that all artists seem to have a button you can click to "follow" them, not all of them actually post on Connect.

Here again we have to ask: why not allow Apple Music subscribers to connect and follow each other? That would certainly bring a lot more interaction, as make the service more useful. As much as you can leave comments on the artists' posts, it doesn't seem like there are any real conversations being started, so there isn't much that users can do on Connect as yet.

This is one feature that really doesn't quite exist on any of the other services as yet. As much as Deezer has podcast interviews with artists, and Spotify has their Spotlight feature, those are both very much curated experiences and so don't bring the immediacy that Connect can potentially offer.

After biting into the Apple

At this point, Apple Music succeeds in some parts yet fails in others. Unlike Spotify, Deezer and Tidal, the only access to Apple Music is via iTunes on your computer, iPod or iPhone. That's fine if you're tuning in from home; not so much if you're trying to tune in from the office and don't wish to install additional software. A web-based player would be a definite plus. The navigation in iTunes needs some work too, as there's no obvious way to jump back to the track list level of a playlist if you've moved on to browse other sections. Too much is hidden behind a set of tiny icons or another now, making it difficult to navigate. Technical glitches remain, with users reporting issues trying to add songs to playlists (not all methods to add songs work apparently).

Also, not being able to import playlists from other services and not having the option of user-generated content means you will invariably have to start from scratch if you want to switch to Apple Music. That's a heavy cost, especially if you've been on any of the other services for an extended period of time.

The final word

Ultimately, we think it comes down to how much Apple values mind share over profits. Their price plans are on par with the competition at \$9.98; the Family subscription option is quite a steal at \$14.98 for up to six users. But not having a freemium tier will hurt, as what you gain in convenience from Apple Music's all-in-one service doesn't outweigh the pain of switching from the existing alternatives, especially when you can get 80% of the experience for free.

If Apple truly wants to make headway in the music streaming space, they should make it as easy as possible for users to transplant their current music streaming experience from another player to Apple Music. Then it becomes a question of "Why not?". With the iTunes infrastructure already in place to cater to offline listening via track and album purchases, and the ever-growing base of Mac users worldwide, it certainly seems as though the only thing keeping Apple from dominating, is Apple itself. **HMM**

Apple Music succeeds in some parts yet fails in others. Unlike Spotify, Deezer and Tidal, the only access to Apple Music is via iTunes on your computer, iPod or iPhone.



Getting to know Intel Z170

Text by *Koh Wanzi* Art Direction *Ken Koh*

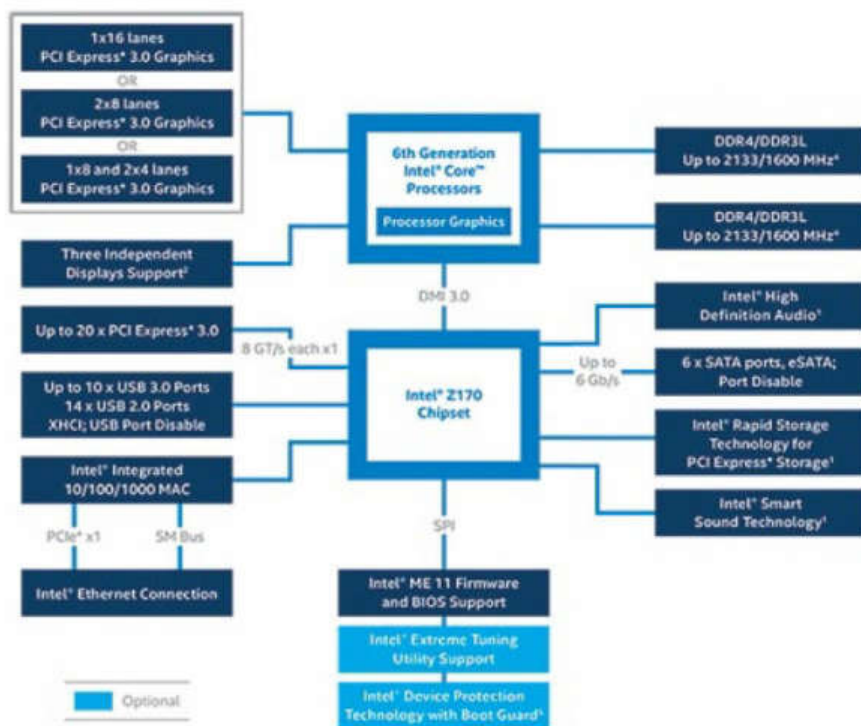
PC enthusiasts can finally breathe a sigh of relief. Now that the tedium that was Broadwell is safely out of the way, we can finally focus on the performance CPU parts that are Skylake and Intel's new Z170 chipset.

No more half-baked 65-watt parts! New Skylake desktop parts in the form of the Core i7-6700K and Core i5-6500K have already debuted, with a reassuring 91-watt Thermal Design Power (TDP) that we'd expect of CPUs geared for performance.

So the CPUs – a couple of them at least – are ready, but what about the chipset? Z170 offers several significant improvements over last year's Z97, and we'll take you through the key new features and their practical implications.

A Brand New Socket

Intel Z170 will feature a new LGA1151 CPU socket, which means you won't be able to use LGA1150 Haswell or Broadwell chips on a Z170 motherboard. Fortunately, Intel has maintained its practice of preserving CPU cooler compatibility across different socket generations, so you will still be able to use LGA1150/1155/1156 coolers with Z170 boards and Skylake CPUs.



Intel Z170 Chipset Diagram





DDR4 arrives in the mainstream

One of the major steps forward for Intel Z170 is the support for DDR4 memory, which marks the first time that DDR4 support will be available on a chipset other than the ultra-enthusiast Intel X99. In fact, Skylake motherboards will dispense with support for DDR3 entirely, and will support either DDR4 or DDR3L RAM. But because the slots are different for each memory type, motherboards will only be able to support one of them, and the overwhelming majority of boards are going to opt for DDR4, which offers several advantages over older DDR3 modules.

For starters, DDR4 has a lower operating voltage of 1.2V, down from 1.5V on DDR3. It also boasts higher data transfer rates – Skylake's memory controller supports DDR4 2,133MHz by default, as compared to DDR3 1,600MHz on Haswell CPUs and Intel Z97. Furthermore, DDR4 enables higher memory densities, which means up to 16GB modules. Intel Z170 supports up to 64GB across four DIMMs, so you can really load up those RAM slots if you're of the persuasion that there is no such thing as too much RAM.

To cap things off, manufacturers are also releasing kits at frequencies that DDR3 would be hard-pressed to match. For instance, the new G.Skill Trident Z memory is available in kits clocked up to 4,000MHz, nearly double that of the 2,133MHz base specification.

These advantages aside, DDR4 does have a slightly higher CAS latency than DDR3 because of the higher memory frequencies. CAS latency is a measure of the time – or more precisely the number of clock cycles – taken by the memory to send data back to the processor when it receives a command. On the other hand, memory frequencies indicate how quickly the system can access data on the RAM. So while it might seem like higher CAS latencies would mean that DDR4 is slower, the outcome isn't always so straightforward because the two work together to influence memory performance.

Memory performance is determined more accurately by the actual latency time, which is measured in nanoseconds (ns). Faster memory clock speeds result in shorter clock cycles between when the memory receives a command and when it actually responds, so even though the CAS latency goes up – more cycles – the actual latency time still decreases, resulting in overall faster memory.

PCIe 3.0 support and high-speed storage

With Z170, the processor is now connected to the chipset's Platform Controller Hub (PCH) by the upgraded DMI 3.0 protocol. Compared to the DMI 2.0 used in Z97, DMI 3.0 features a speed boost from 5.0 GT/s to 8.0 GT/s, which enables significant upgrades in chipset connectivity.

This explains why Intel Z170 is now able to support PCIe 3.0 on the chipset itself instead of PCIe 2.0 as on Z97. This results in a total of 20 PCIe 3.0 lanes being exposed through the chipset, compared to just eight PCIe 2.0 lanes on Z97. Skylake CPUs will continue to provide 16 PCIe 3.0 lanes for your graphics card, but additional PCIe 3.0 lanes on the chipset itself will now be available for use with PCIe 3.0 x4 storage devices.

These devices were of course supported on higher end Z97 motherboards, but it entailed drawing from the 16 PCIe 3.0 lanes provided by the CPU. So if you plugged in an M.2 PCIe 3.0 x4 SSD into a compatible board, the bandwidth sharing would force the PCIe 3.0 x16 slot to run in x8 mode.

But with Z170, such bandwidth sharing is no longer necessary and you'll be able to utilize the maximum available bandwidth for both your graphics card and PCIe 3.0 x4 SSD. PCIe-based SSDs will eventually replace SATA-based drives, and it's great to finally see proper support for high-speed storage devices on Intel's latest mainstream chipset.

More Connectivity Options

Z170 also has a far more flexible selection of High-speed Input/Output (HSIO) ports than Z97. While the latter had 18 such ports that could switch between the PCIe lanes, USB 3.0 ports and SATA 6Gbps ports, Z170 now has 26 ports that can be implemented in a variety of ways.

This gives motherboard manufacturers greater ability to pick and choose what combination of connectivity options they'd like to offer. For instance, the new Intel Rapid Storage Technology (RST) allows Z170 to support up to three PCIe devices at one time, which means that M.2 and SATA Express devices can be installed in RAID arrays as long as they are connected via these HSIO lanes. In addition, this would



PICTURE MSI

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USB3 #1	USB3 #2	USB3 #3	USB3 #4	USB3 #5	USB3 #6	USB3 #7	USB3 #8	USB3 #9	USB3 #10	PCIe #5	PCIe #6	PCIe #7	PCIe #8	PCIe #9	PCIe #10	PCIe #11	PCIe #12	PCIe #13	PCIe #14	PCIe #15	PCIe #16	PCIe #17	PCIe #18	PCIe #19	PCIe #20
										PCIe #1	PCIe #2	PCIe #3	PCIe #4	GbE		GbE		SATA #0	SATA #1	SATA #2	SATA #3	SATA #4	SATA #5	SATA #6 (Server Only)	SATA #7 (Server Only)
										X4		X4		X4		X4		X4		X4		X4		X4	
										X2		X2		X2		X2		X2		X2		X2		X2	
														Intel PCIe Storage Device #1				Intel PCIe Storage Device #2						Intel PCIe Storage Device #3	

Intel Z170 HSIO port layout

allow motherboard manufacturers to implement up to three PCIe 3.0 x4 M.2 slots on their boards, complete with RAID support.

But even though Z170 officially supports 10 USB 3.0 ports (up from six on Z97), six SATA 6Gbps ports, and 20 PCIe 3.0 lanes, you can't have everything all at once because the USB 3.0 and SATA ports use PCIe lanes as well. For example, populating both M.2 PCIe 3.0 x4 slots on the MSI Z170A Gaming M9 ACK will end up disabling two of the six SATA 6Gbps ports. This is because the SATA ports use a PCIe lane each, which overlaps with the lanes used for the M.2 slots.

More expensive boards, but cooler CPUs

Finally, Intel Z170 will see motherboard manufacturers return to implementing voltage regulation on the board itself. This was the case prior to Haswell CPUs, but Z97 and Haswell/Broadwell processors saw Intel create a fully integrated voltage regulator (FIVR) on the CPU itself in order to reduce motherboard costs and power consumption. However, this also had a less desirable consequence in the form of additional heat output in overclocked CPUs. As a result, overclocking was limited by temperatures, and also by the varying quality of the FIVR on individual chips.

With Skylake and Z170, Intel has handed the task of voltage regulation back to motherboard, which could result in cooler processors, but slightly more pricey boards.

The top two PCIe 3.0 x16 slots feature metal reinforcements to support heavier graphics cards.

Z170 motherboards: A Sampling Platter

Of course, the aforementioned technicalities don't do a lot for visualization. We've rounded up a few boards from major manufacturers to show you what's really on offer.

ASRock Fatal1ty Z170 Gaming K6 (\$370)

The ASRock Z170 Gaming K6 sports a matte black PCB and striking accents of red along the heat sinks, PCIe, and RAM slots. The PCH heat sink has also been emblazoned with the silver praying mantis emblem of the Fatal1ty series.

Networking is handled by the Killer E2400 Ethernet controller that also features on boards from Gigabyte and MSI. Storage options include up to eight SATA 6Gbps ports and a single M.2 slot that supports both SATA and PCIe-based drives. The M.2 slot also supports a U.2 adapter kit for installation of NVMe 2.5-inch drives like the Intel 750 series SSDs, and similar adapters are also available for boards from the likes of ASUS and MSI.

In addition, USB 3.1 Type-A and Type-C ports again make an appearance on the rear I/O panel, courtesy of the familiar ASMedia 1142 controller. Other standout features include a macro program called Key Master to help you program hotkeys and macros on both keyboard and mouse, and an external base clock generator for finer control over overclocking.



ASUS Z170-Deluxe (\$559)

This board sits at the top of ASUS' lineup of mainstream Z170 boards, adorned with a striking white rear I/O cover and heat sinks. The Deluxe comes with premium features like 3x3 802.11ac Wi-Fi, five USB 3.1 Type-A ports, and one USB 3.1 Type-C port. Z170 does not yet support USB 3.1 on the chipset, so USB 3.1 functionality is provided by the ASMedia 1142 controller, which is the go-to controller for select boards from other brands as well.

There are eight SATA 6Gbps (including two SATA Express ports), two more than the six supported by the chipset. As with USB 3.1 functionality, ASUS has turned to the third-party ASM1061 controller to provide the additional SATA 6Gbps ports.

Networking is handled by dual Intel I219-V and I211-AT controllers, yet another example of the third-party controllers needed to provide additional functionality like Gigabit Ethernet. The first two full-length PCIe 3.0 slots will run in x8/x8 mode (16 lanes from the CPU) with dual-graphics cards, but the last slot actually only runs in x4 mode off the chipset itself.

An integrated 5-way Optimization feature automatically takes into account various use cases and optimizes your system for either performance or energy savings.



PICTURE: ASROCK & ASUS



ASUS Maximus VIII Hero (\$469)

Here's another board from ASUS, this time from its much-vaunted Republic of Gamers series. The gunmetal gray heat sinks with red accents are a joy to look at, and this board offers fairly good value in the ROG series.

Like the Z170-Deluxe, the Maximus VIII Hero ASM1061 controller makes a return to provide two SATA 6Gbps ports, on top of the six SATA 6Gbps from the chipset itself. In addition, the single M.2 slot can only run in PCIe 3.0 x4 mode from the chipset and will only support PCIe SSDs. And as expected of a board of this caliber, two USB 3.1 Type-A and Type-C ports are also found round the back.

Storage connectivity options aside, the board comes packed with standard ROG features like the upgraded SupremeFX 2015 audio circuitry, GameFirst network prioritization software, and a spanking new RGB backlit ROG logo on the PCH heat sink.



Gigabyte Z170X Gaming G1 (\$939)

This top-end model from Gigabyte comes with metal-reinforced PCIe slots, a feature that's also found on select MSI boards. Notable features include a PLX chip to allow dual-graphics setups to run in x16/x16 mode, although it should be noted that this has more to do with PCIe lane switching rather than the provision of an extra 16 lanes.

There are also two PCIe 3.0 x4 M.2 slots, although installing drives in both of them will disable certain PCIe slots and SATA ports.

In addition, it combines dual Killer E2400 network ports with a Killer 1535 802.11ac dual-band Wi-Fi module for a gaming-oriented network solution. This means that it supports the Killer DoubleShot X3 Pro network manager, which automatically routes traffic across the fastest network interface (either one of the Gigabit Ethernet controllers or the Wi-Fi module).



MSI Z170A Gaming M5 (\$379)

The MSI Z170A Gaming M5 falls under MSI's top-end Performance series of motherboards, and as such comes with a handful of gaming-oriented features. As the middle-of-the-pack model in the series, the Gaming M5 has shed features like a manual overclocking knob called Game Boost and a rear I/O cover.

It retains the new Killer E2400 Gigabit Ethernet controller, which adds features like the ability to prioritize network traffic for both websites and applications. The ASM1142 controller is responsible for USB 3.1 Type-A and Type-C connectivity, so you still get support for the fastest external storage devices.

One of the two onboard M.2 slots is also a SATA-only slot, and using it will disable a pair of SATA 6Gbps ports. The other is a PCIe 3.0 x4 slot, and it's a little strange to see that MSI hasn't opted to just let both ports use four PCIe lanes from the chipset.

Unique features include DDR4 Boost, which takes a leaf from the design of the audio circuitry and isolates the memory signals from the rest of the PCB in order to produce a cleaner signal. As on the Gigabyte board, metal-reinforced PCIe slots also make an appearance here.



More Intel 100 series chipsets

Z170 is Intel's mainstream, performance-oriented chipset, but Intel is also releasing five other Skylake-based chipsets for business users and consumers on a budget. H170 is a more budget-friendly version of Z170, lacking features like overclocking support and the ability to run multiple graphics cards, but otherwise retaining identical support for memory and storage configurations. H110 sits at the bottom of the consumer chipsets, dispensing with support for Intel RST and PCIe 3.0 from the chipset, and allowing only a single RAM module in each channel. The Q170, Q150 and B150 chipsets are targeted at business users, providing features like Small Business Advantage 3.0, Small Business Basics and Intel vPro technology.



PICTURE: ASUS, GIGABYTE, MSI & INTEL

DDR4 RAM for your new Skylake build

Motherboards aside, you'll be needing some new DDR4 RAM modules to go with your new build. DDR3 is no longer supported, so there's no porting over old RAM modules from your old system. Here are some DDR4 kits from the major manufacturers, complete with sleek brushed metal finishes and some aggressive military styling.

G.Skill Trident Z 8GB (2x4GB) DDR4 3,600MHz

This overclocked 3,600MHz kit is rated to run at an operating voltage of 1.35V. The heat spreaders sport a silver-gray brushed metallic finish, and a couple of notches toward one end help convey a suitably elegant yet sophisticated touch to the modules. If you're particular about aesthetics, we think the red-and-gray color scheme will go especially well with ASUS' Z170 ROG and MSI's Gaming series of boards.



Kingston Hyper X Fury 8GB (2x4GB) DDR4 2,666MHz

The all-black heat spreaders are adorned with only the Fury and DDR4 branding in white text, alongside a slate-gray HyperX logo. As far as performance-oriented memory modules go, these are fairly plain and should go well with the look of most otherboards. In addition, it supports a convenient automatic overclocking feature, which enables the memory to boot up at its rated speed – in this case 2,666MHz – after installation.



Corsair Venegance LPX 8GB (2x4GB) DDR4 2,400MHz

Designed for overclocking, the Vengeance LPX's heat spreader is made of pure anodized aluminum for quicker heat dissipation as heat output can increase considerably at higher frequencies. There's also an eight-layer PCB to further help manage heat and provide improved overclocking headroom. Vengeance LPX kits are available in different colors – black, red and blue – so you can pick the one that best suits your system.



Crucial Ballistix Tactical 8GB (2x4GB) DDR4 2,666MHz

The gunmetal gray heat spreaders on these sticks are one of the more aggressive designs here, and we can't help but feel that they belong on a motherboard with a similarly military-esque design. The ASUS Z170 Sabertooth Mark I comes to mind, as do other boards with chunky VRM heat sinks, like the ASRock Z170 Gaming K6+. It runs at an operating voltage of 1.2V, and the heat spreaders have been designed for maximum heat dissipation.



G.Skill Ripjaws V 8GB (2x4GB) DDR4 2,133MHz

The new Ripjaws V memory comes in an impressive array of five colors – Blazing Red, Steel Blue, Radiant Silver, Gunmetal Gray, and Classic Black. This particular kit comes in red, and unlike the more understated appeal of the Trident Z series, the Ripjaws V memory modules also boast an aggressive design clearly targeted at gamers. It runs at the default speed of 2,133MHz, so if you aren't the overclocking type and want a relatively safe and stable kit, this is for you.



Kingston Hyper X Savage 8GB (2x4GB) DDR4 3,000MHz

These Hyper X Savage DDR4 modules are equipped with low-profile, 32.8mm tall black heatspreaders to accommodate larger CPU coolers. The heatspreaders are constructed of die-cast aluminum for better heat dissipation and sport an asymmetrical, ridged design for a standout appearance. Black PCBs complete the all-black look, and these modules will likely go well with most motherboards, regardless of manufacturers' color choices. **HWM**



CORPORATE ROAD WARRIOR

by Koh Wanzi

Business trips can actually be quite disruptive. Not only do you have to stay on top of the trip's agenda, you also probably have to keep up with the work you left behind in the office. Here are some cool gadgets to help you stay productive on-the-go. Work doesn't necessarily have to be boring!



DOT
DOT.SOSPECIALLABS.COM

We're pretty sure that the last thing you want while traveling is an uncomfortable earpiece attached conspicuously to your ear. Enter Dot, the world's smallest Bluetooth earbud that fits discreetly into your ear. It features a single multi-function button that allows you to answer or end calls with a tap. A single dynamic driver is packed into its tiny aluminum and polycarbonate shell. It works with iOS, Android and Windows Phone devices. You can pair it with up to eight devices or together, so you can enjoy stereo music as well!



ROCKETBOOK
WWW.ROCKETBOOK.IT

Digital screens and styluses aside, there's something about handwritten notes that feels more natural, especially when you're on the move. The Rocketbook lets you indulge in your penmanship, then send the notes to a cloud service like Dropbox or Evernote. Each page has seven icons at the bottom, which you can assign to your cloud service of choice. To organize your notes before uploading, simply mark the right icon on the page, launch the mobile app, and let it do the rest. Using the Rocketbook with Pilot Frixion pens also allows you to – wait for it – wipe your notes by microwaving the entire notepad.



LIVESCRIBE ECHO
WWW.LIVESCRIBE.COM

Say you're at a conference and want to make a recording of the proceedings. Instead of whipping out a clunky recorder or your smartphone, you can simply use the Echo smartpen to simultaneously record audio and take notes. Audio can also be linked to your notes, so you can replay past recordings by tapping on the relevant note. The built-in speakers will handle playback just fine, but you can plug in your own headphones via the 3.5mm jack at the pen's top. The Echo can hold up to 200 hours of audio, which should be enough for even the most packed of business trips.



CELLUON EPIC
WWW.CELLUON.COM

Your iPad is a great work companion, but when you're a frequent traveler who's always on the move, its onscreen keyboard may not be the most productive tool. The Celluon Epic virtual keyboard uses a red laser diode to project a full-sized QWERTY keyboard on any flat, opaque surface. It fits perfectly within your palm and will pair with almost any Bluetooth device. An additional mouse tracking feature means it will also work with 2-in-1 hybrid devices, allowing you scroll, zoom, and even right-click.



LEGION CONCEPTS CHARGING BRIEFCASE
WWW.LEGIONCONCEPTS.COM

Ever had to wander disconsolately through transit terminals looking for a wall outlet? Always lamenting about the multiple portable batteries you carry? Legions Concepts' charging briefcase streamlines the process with its built-in 10,000mAh removable battery pack. It even comes with three adapters to charge up to three devices simultaneously. You'll be able to charge most smartphones five times, and a tablet once, which should be enough to tide you over most battery emergencies. Its exterior is constructed of durable 1680D ballistic nylon, and dedicated cable pass throughs help keep your wires organized.

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SPHmagazines

TEST

LAB RESULTS

Every month behind the doors of our super secret gadget testing facility, the latest tech products are put through their paces using industry recognized benchmarks and our own blend of real world usage scenarios. Here are our findings.

MORE INSIDE >

FUJIFILM X-T10

The little camera that could.

LINKSYS EA8500

Banking on a wireless future.

TOMTOM GO 610

Still the better GPS navigator for your car.



HOW WE RATE:

Products are rated on a scale of **1** to **10**; **1** being so abysmal, it should be a crime to sell it, and **10** being almost perfect. Come now, nothing is perfect. An Editor's Choice may also be awarded based on unique merits.



MID-RANGE IS THE NEW FLAGSHIP

Last year, a mid-tier smartphone with 4G connectivity would be a head turner. Fast forward to date, we have the same mid-range models touting flagship processors and camera modules, monstrous RAM, premium materials and dual-SIM functionality. Here are four such phones you can get for around \$600.

Text by *Liu Hongzuo*

Photography by *Darren Chang + Angela Guo*

Art Direction by *Ken Koh + Ian Chong*



VS

ONE PLUS 2

•

OPPO R7

•

SAMSUNG GALAXY A8

•

XIAOMI MI NOTE



ONEPLUS 2

Last year, OnePlus made a name for itself with its high performance, low price OnePlus One smartphone, a flagship-level device sold at mid-range level prices. A year on, and OnePlus is back and more confident than ever, proclaiming its latest smartphone as the "2016 Flagship Killer".

Unlike the mostly-plastic predecessor, the OnePlus 2 boasts a new frame made from a magnesium/aluminum alloy, resulting in a successor that feels premium. Besides having a fingerprint scanner on the Home button, there's also an Alert Slider switch to the side – for toggling notification alerts and ringtones. It feels really solid, and it is hard to flick it to the wrong position and end up missing an important call.

While it still won't catch up to the flagship Samsung Galaxy Note 5 or S6 Edge in terms of benchmarking results, the combination of 4GB RAM, octa-core Qualcomm Snapdragon 810 processor, and Adreno 430 graphics unit makes the OnePlus 2 hum along with no signs of lag in everyday use – between games, videos, and apps. Its modified Android operating system – OxygenOS – on the OnePlus 2 seems to play nicely with the phone's available resources.

This brings us to the extra functionality

that OxygenOS gives us, which is beyond what stock Android OS offers. OnePlus 2 has app-by-app permission settings. While it's not a new concept, the OnePlus 2 does it makes the process feel more controllable than stock Android OS. There's also Shelf – a feature that lists your most frequent contacts and apps, but it is essentially another version of Google Now.

+
**Great value.
Flagship-tier
performance.**

–
Difficult to buy.

Premium-grade qualities aside, the OnePlus 2 does carry the traits that make it a thorough Chinese-made smartphone with features – even bad ones – borrowed from its harshest critics. There's dual-SIM with LTE connectivity on both slots, but no MicroSD card slot. It may be one of the first commercially available smartphone with USB Type-C port, but it doesn't have USB 3.1 transfer speeds. The biggest peeve is exactly the same one as its predecessor – you

can only purchase the device with an invite bestowed upon you by OnePlus themselves.

Despite its shortcomings, the OnePlus 2 is certainly a grade above its mid-tier peers. To call it a flagship killer of 2016 is hyperbole, since it's only keeping up with the competition from this year's flagships. Nonetheless, the OnePlus 2 is certainly still an amazing bang for the buck, if you can get an invite to buy one that is.



AT A GLANCE

Display

5.5-inch IPS LCD
1,920 x 1,080 pixels
(403 ppi)

Processor

Qualcomm Snapdragon
810 octa-core 1.5GHz

Weight

175g

Dimensions

151.8 x 74.9 x 9.9mm

Price

\$598



The rear 13-megapixel camera features laser autofocus and OIS.



The default Sandstone Black rear cover has a grip-friendly texture.



The OnePlus 2 uses USB Type-C port for charging and file transfers.

OPPO R7

Oppo R5 was known for being 4.85mm-thin, but it had a tiny battery capacity to contend with. The R7 ramps up the quality of the phone across the board, topped off with a premium finish to the phone's chassis.

Currently, the R7 measures 6.3mm thin, but the phone still feels very slender to the touch. It's one of handful of mid-range smartphones with a proper metal unibody frame with a rear made from an aircraft-grade magnesium/aluminum alloy. Oppo also claims that their R7 had undergone 48 polishing processes to achieve its current look. The sides feature chamfered metal edges that interrupt the rounded bezel finish on rear and front glass to provide excellent grip.

The R7's 5-inch Full HD (1,080 x 1,920 pixels) AMOLED screen with nearly 441ppi makes the colors look vibrant and the high pixel density makes images appear really sharp. With ColorOS 2.1's Eye Protection Display, you can pick between the three for different filter intensity for shortwave blue light, and helps to reduce eye strain while using the smartphone.

This particular model does a nano-SIM, micro-SIM combination with dual standby

support. You could also choose to give up the second SIM card slot to place a MicroSD card of up to 128GB, making the default 16GB internal storage less of a problem.

The phone uses a decent mid-range processor (Snapdragon 615) coupled with 3GB RAM. It does not struggle when loading web pages, with only slight stuttering when you open a new tab or when you wake the locked phone in the middle of browsing. Actual usage was smooth, save for launching or switching between apps.

The Oppo R7's 2,320mAh battery capacity lasted nearly 10 hours in our test, which was very decent for a smartphone with less battery life than its peers. What the R7 has in its favor is the proprietary VOOC Flash charge Mini, which uses increased voltage charging to achieve the same quick charging effect as Qualcomm's Quick Charge 2.0. Our test device gets roughly 25% every half hour, so it's possible to have 100% in just two hours.

It's likely that the Oppo R7 will be overshadowed by the R7 Plus, but the smartphone feels complete on its own. While it may not be the best buy among other models such as Xiaomi Mi Note, the Oppo R7 does justice to design detail and practical features.

+
Premium chassis and practical features.

-
Low internal storage.



AT A GLANCE

Display

5.0-inch AMOLED
1,080 x 1,920 pixels
(441ppi)

Processor

Qualcomm Snapdragon
615 octa-core 1.5GHz

Weight

147g

Dimensions

143 x 71 x 6.3mm

Price

\$569



The R7's speaker is on the rear, limiting its audio capabilities when the phone is facing up.



The Oppo R7 has a dual-SIM slot with the second tray doubling as a MicroSD card slot.



2.5D arc edge screen accentuates the premium quality of its build.

SAMSUNG GALAXY A8

Like its earlier companions –A3, A5 and A7 – the 5.9mm-thin phablet comes with a metal uni-body, which gives the device a premium look and feel. Samsung made the 5.9mm metal frame chamfered for extra style points. Despite its broad phablet dimensions, the A8 feels easy to grip with evenly distributed weight.

The A8 uses a 5.7-inch Full HD (1,920 x 1,080 pixels) SUPER AMOLED display at 386ppi. Image is sufficiently sharp with vibrant colors; the screen is bright at 100%, but not glaring.

They did adopt a handful of features from the Galaxy S6, but some of them are quite unnecessary. An example would be Briefing: when not in use, Briefing does tend to take up precious time and processing power if you scroll to it accidentally. On the flip side, the A8 does come with features that are actually useful and practical.

The A8 has a unique two-tray design for its dual-nano SIM slot. The primary SIM slot works with LTE Cat 6 networks, but the secondary slot is only compatible with 2G networks.

The Fingerprint Sensor on the A8 does exactly its purpose – providing an alternative to users for securing their phone. The phone also has a MicroUSB 2.0 port with OTG (on-the-go)

support. This means that you can connect a USB OTG drive to it, and it acts as additional storage for the phone.

Like most of its new devices, the A8 uses Samsung's own Exynos 5430 octa-core processor. Performance was satisfactory in benchmarks and real-world testing; certainly

not as nimble as flagship models like the Samsung Galaxy Note 5, but the A8 performs speedily, with nary a jitter in its everyday use.

The A8 uses a 16-megapixel camera for the rear, and a 5-megapixel front camera, and we feel that the camera's quality is good for a mid-range smartphone. Sharpness is intact, and colors are generally acceptable save for the ones that are difficult to tell apart.

The 3,050mAh capacity on the A8 gives it decent battery life. With activity time north of 14 hours, the smartphone is

able go unplugged for the greater part of the day.

On its own, the Samsung Galaxy A8 is indeed a good alternative to the flagship Galaxy S series. Unfortunately, reality is a harsh mistress. Unless you're dead set on a Samsung, the A8 has to go up against the cheaper Chinese competition with similar or better hardware, performance and build quality.

+
**Well-optimized.
Flagship
features.**

–
**Bloatware
galore.**



AT A GLANCE

Display

5.7-inch Super AMOLED
1,920 x 1,080 pixels
(386 ppi)

Processor

Samsung Exynos
5430 Octa-core

Weight

151g

Dimensions

158 x 76.8 x 5.9mm

Price

\$698



The display looks large, thanks to the 2.5mm-thin bezel.



The Galaxy A8 uses a modified Galaxy S6 camera module to fit its thin profile.



Separate dual-SIM trays make this model unique from most of the competition.

XIAOMI MI NOTE

The 5.7-inch Mi Note phablet is a cut above the wallet-friendly offerings Xiaomi has offered in the past, and its premium design, build and specs put it in the same league as flagships from other smartphone giants.

The Mi Note has array of impressive features such as a 13-megapixel Sony camera with OIS, 3,000mAh capacity battery, dual-nano and micro SIM card tray slots, and an onboard ESS ES9018K2M stereo DAC (digital-to-analog converter) which grants the phablet lossless audio playback. Its metal frame shares resemblance to the iPhone and Samsung Galaxy smartphones, but with curved glass wrapping the front and back.

If we look at benchmark numbers, the Mi Note measures on par with the iPhone 6 Plus and even outperforms the iOS-based phone at graphics-processing and CPU tests with its Snapdragon 801 chip. Same could be said for its rear camera – image quality is very good, and rivals any other flagship phone out there. The optical image stabilization works well, and low light shots retain detail and sharpness.

One interesting feature would be Xiaomi

giving plenty of care to the audio capabilities of the Mi Note. The difference between the Mi Note and my iPhone 6 was readily apparent, when you use the Mi Note's high-res (24-bit/192kHz) audio player, paired with a decent pair of headphones and 192-bit AAC music tracks. While the integrated speakers

are sufficiently loud and clear, the one-directional quality of the audio does make it less than ideal for landscape movie watching.

Laudable qualities aside, the Mi Note sadly doesn't come with a MicroSD card slot. We feel fine with missing out on the 16GB version, since the Android-based MIUI 6 would leave it with barely 10GB left on a phone with no external storage. Despite how closely it resembles the iPhone 6 Plus, Xiaomi probably should have left this Android advantage in the phablet. Also, the Mi Note

heats up considerably with extended high-performance usage, but that seems to be commonplace among Android-based devices.

The Mi Note is still an unbelievably good buy. Ignoring the absence of an expandable storage, it has no other major kinks. At just \$569 for the 64GB version, it's pretty much a steal, given its build and performance.

+
Overall performance.
Physical build quality.

–
No expandable storage.



AT A GLANCE

Display

5.7-inch IPS LCD
1,920 x 1,080 pixels
(386 ppi)

Processor

Qualcomm Snapdragon
801 quad-core 2.5GHz

Weight

161g

Dimensions

155.1 x 77.6 x 6.95mm

Price

\$569



Glass is curved 2.5D in front and 3D at the back makes the Mi Note fit nicely in hand.



Measuring just 4.1mm thin, the Mi Note uses nano-molding technology to get its textured aluminum bezel.



Mi Note also uses two separate trays for dual-SIM compatibility.

Sunspider Javascript

(lower is better)

SunSpider Javascript helps measure the browsing performance of a device when processing Javascript. It not only takes into consideration the underlying hardware performance, but also assesses how optimized a particular platform is at delivering a high-speed web browsing experience.

ONEPLUS 2

649.2

OPPO R7

1,476

SAMSUNG GALAXY A8

859

XIAOMI MI NOTE

682.3

Battery Performance

(higher is better)

We use a 800 x 480-pixel resolution video under the follow conditions: screen brightness and volume at 100%, with active Wi-Fi active and Bluetooth running, on top of constant data-streaming from email and Twitter.

ONEPLUS 2

660

OPPO R7

599

SAMSUNG GALAXY A8

627

XIAOMI MI NOTE

627

Quadrant

(higher is better)

The Quadrant benchmark evaluates a device's CPU, memory, I/O, and 2D/3D graphics performance. It takes into account the hardware available for each device, as well as their optimization, which includes the device's ability to move between apps and how resource-hungry they are while in use.

ONEPLUS 2

30,622

OPPO R7

16,898

SAMSUNG GALAXY A8

25,174

XIAOMI MI NOTE

24,372



MODEL	ONEPLUS 2	OPPO R7	SAMSUNG GALAXY A8	XIAOMI MI NOTE
OS	Android 5.1.1 Lollipop with Oxygen OS 2.0	ColorOS 2.1, Android OS 4.4.2 (KitKat)	Android 5.1 OS (Lollipop)	Android 4.4.2 Jelly Bean with MIUI 6
PROCESSOR	Qualcomm Snapdragon 810 octa-core (quad-core 1.5GHz Cortex-A53 & quad-core 2GHz Cortex-A57) processor	Qualcomm Snapdragon 615 octa-core 1.5GHz	Samsung Exynos 5430 Octa-core (1.8GHz Quad Core + 1.3GHz Quad Core)	Qualcomm Snapdragon 801 quad-core 2.5GHz
MEMORY	4GB (64GB)	3GB RAM	2GB RAM	3GB RAM
STORAGE	Internal 64GB	16GB Internal, MicroSD slot up to 128GB	32GB ROM, MicroSD up to 128GB	Internal 64GB
DISPLAY	5.5-inch IPS LCD 1,920 x 1,080 pixels (403 ppi)	5.0-inch AMOLED 1,080 x 1,920 pixels (441ppi)	5.7-inch Super AMOLED 1,920 x 1,080 pixels (386 ppi)	5.7-inch IPS LCD 1,920 x 1,080 pixels (386 ppi)
REAR CAMERA	13-megapixel, f/2.0, laser autofocus, optical image stabilization, dual LED flash.	13-megapixel, f2.2, 4128 x 3096 pixels, Samsung 3M2 with ISOCELL technology, Schneider-Kreuznach optics, phase detection autofocus, LED flash, anti-shake optimization	16-megapixel ISOCELL technology, 5312 x 2988 pixels, autofocus, LED flash, 4x Digital Zoom	13-megapixel with Sony sensor, f2.0, dual-LED flash, optical image stabilization
FRONT CAMERA	5MP	8MP	5MP	4MP, f2.0, 2µm pixel size
CONNECTIVITY	Bluetooth 4.1, Wi-Fi 802.11 a/b/g/n/ac (2.4 and 5GHz), Micro-USB Type-C, 4G LTE	Bluetooth 4.0, Wi-Fi 802.11 a/b/g/n/ac (2.4 and 5GHz), NFC, DLNA, Micro-USB 2.0,	Wi-Fi 802.11 a/b/g/n/ac (2.4+5GHz), Wi-Fi Direct, GLONASS, Quick Connect5, Mobile hotspot, Quick Connect	Wi-Fi 802.11 a/b/g/n/ac, Bluetooth 4.1, GPS, dual 4G LTE
BATTERY	3,300mAh	2,320mAh	3,050mAh	3,000mAh
PRICE	\$598 (64GB)	\$569	\$698	\$569

AND THE BEST MAINSTREAM FLAGSHIP SMARTPHONE IS



TEST
BEST
PERFORMANCE
HWM
SINGAPORE

ONEPLUS 2

We can see why they dare to call the OnePlus 2 the "Flagship Killer of 2016". While it doesn't actually live up to that title, against other current smartphones within its bracket, it's an outright bully. It's the only phone that fits in the sub-\$600 category with flagship-class hardware. While we were very taken with the Xiaomi Mi Note when we first reviewed it in January, its Snapdragon 801 processor is showing its age. The Mi Note Pro would have been a better comparison, but Xiaomi isn't officially selling that in this region. Perhaps the higher powers like to play fair, because the only way of buying a OnePlus 2 is through an invite code from OnePlus themselves.

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LIGHTWEIGHT GAMING PERFORMANCE

Being a slim 15-inch notebook is a constant juggling act to keep hardware in balance. How do you get gaming-grade performance and keep things portable and stylish? Here are some of the best, updated with newer hardware and ready to rock your world.

Text by *Salehuddin Husin*

Photography by *Jasper Yu + Cheryl Reharjo*

Art Direction by *Ian Chong*



VS

AORUS X5

•

ASUS ROG G501

•

GIGABYTE P35X V3

•

HP OMEN



AORUS X5

The Aorus X5 is the newest of the Aorus X series gaming notebooks, famed for being incredibly thin and light while packing an SLI configuration. The Aorus X5 continues this tradition with a mainstream offering of SLI NVIDIA GeForce GTX 965Ms.

While it may be a step down from the Aorus X7 Pro's SLI GeForce GTX 970Ms, the Aorus X5 was just a step behind the Gigabyte P35X V3 in our benchmarks. Its performance clearly superior to a single NVIDIA GeForce GTX 970M, but just short of reaching the bar set by an NVIDIA GeForce GTX 980M.

Design-wise, its aluminum chassis not only looks cool, but has a very solid feel. Most of the faults present in the Aorus X7 Pro have been ironed out in the new laptop. The trackpad is much more comfortable, more responsive and is now textured for better feedback. The keyboard is also better at resisting finger oils and smudges, though it is still very shallow in order to keep the notebook as thin as it is.

Another plus is that the Aorus X5 can

optionally come with hardware encoding for streaming. If you're somebody who regularly streams your games, this piece of hardware comes in real handy, as it takes some the strain of maintaining the stream off the CPU, letting it focus on other things.

While the Aorus X7 Pro suffered from very high GPU temperatures at 84 degrees Celsius, the Aorus X5, with its lower end GPUs and better heat dissipation runs at a relatively cool at 70 degrees Celsius. Still, because it's an SLI system, NVIDIA's Optimus technology, which manages GPU usage to prolong battery life, isn't available. That's why the X5 only lasted a paltry 122 minutes in our battery life benchmark. As before, this is a desktop replacement machine and not one you'd want to use untethered from a power point.

The best new feature is its G-Sync compatible display, which compliments its graphics horsepower really well. So, you can run most of your games even at max settings and don't have to worry about screen tearing. It's an IPS panel too, so colors and viewing angles are great.

+
Great looks.
G-Sync.

—
Performance
could be better.
Expensive.



AT A GLANCE

Processor

Intel Core i7-5700HQ
(2.7GHz, 6MB cache)

Display

WQHD+ (2,880 x 1,620
pixels) IPS
(G-Sync capable)

Memory

16GB

Graphics

SLI NVIDIA GeForce GTX
965M (8GB VRAM)

Storage

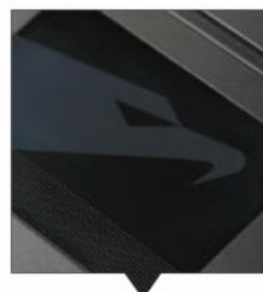
M.2 512GB (256GB x 2
in RAID 0) SSD + 1TB
HDD

Price

\$3,899



The Aorus logo serves as the power button, which also lights up whenever the machine is activated.



The trackpad is textured so that you can feel when you're reaching the bottom portion of the usable space.

ASUS ROG G501

If you're familiar with ASUS, the ROG G501 will be like visiting an old friend. The 15.6-inch machine, while slim, evokes a G751 vibe, with the trademark ROG black and red scheme.

While we're still awaiting Skylake updates, ASUS packs in a decent amount of tech for a very compelling gaming notebook. The G501 has a brilliant 4K display, 16GB of RAM and 512GB of SSD storage. It is the only other notebook here with this much SSD space, though Gigabyte does supplement theirs with a traditional HDD for more storage. The G501 is just a little over 2KG, lightweight enough to carry.

If you're a portable gamer, its humongous battery capacity will be a huge draw. In our tests, it lasted 223 minutes, nearly unheard of for a gaming machine.

In our benchmarks, the machine posted scores similar to that of the HP Omen even though latter came with an NVIDIA GeForce GTX 860M instead of the NVIDIA GeForce GTX 960M present in the ASUS. In Tomb Raider on High for example, the ASUS notebook

posted an average frame rate of 62.2, a couple of frames better than the HP Omen's 58.2 average frame rate. While its performance is sufficient for Full HD gameplay, frame rates expectantly tank at 4K. This is a big deal if you specifically chose this notebook for its 4K

display. While you can rock a sick wallpaper, it doesn't have the GPU power to drive 4K games, which is a shame.

For an ROG machine, it's also surprisingly light on gamer-centric features. Sure, the WASD keys have extra red highlights but other than that, there isn't anything special about the keyboard. There aren't any macro keys or special shortcuts, just the basic keyboard and numpad.

Ultimately, choosing the ASUS ROG G501 depends on the user. Its uniquely long lasting battery, massive PCIe-

based storage, 4K display and lightweight nature will undoubtedly sway casual gamers with a penchant for 4K movies, but for hardcore gamers, there are other options that might be better suited for them, like the 17-inch ROG G751JT.


4K display. Long lasting battery.


Average performance. No extra gamer-centric features.



AT A GLANCE

Processor

Intel Core i7-4720HQ
(2.6GHz, 6MB cache)

Display

4K (3,840 x 2,160 pixels)
LCD

Memory

16GB

Graphics

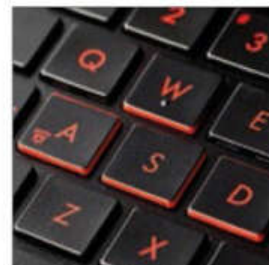
NVIDIA GeForce GTX
960M (4GB VRAM)

Storage

512GB SSD

Price

\$2,898



The machine's keyboard actually has highlighted WASD keys so that you can spot them easier in a pinch. The backlights remain the same color though.



The speakers at the side of the machine aren't as big as those in other laptops but they still deliver decent sound.

GIGABYTE P35X V3

If there is a machine that can be called unassuming, that machine would be the Gigabyte P35X V3. It's not flashy like the ASUS ROG G501 or as sleek as the HP Omen, but its subdued appearance belies its impressive horsepower. It might be a tad heavy compared to some of the other entries in the shootout at 2.3KG, but it also has something rarely seen in slim notebooks nowadays, gaming or otherwise. It has a DVD multi-drive.

With a brilliant WQHD+ display, it delivers stunning picture quality and decent gaming experience at that resolution, thanks to the NVIDIA GeForce GTX 980M that's powering it. In our benchmarking sessions of Middle Earth: Shadow of Mordor, the machine posted an impressive score of 67.57 on Ultra settings.

The machine will also serve well as a portable device with a battery life decent enough to last 182 minutes (that's three hours long); a feat only the ASUS ROG G501 managed to beat.

Unfortunately, the machine also shares some of the downfalls that plagued the Aorus X7 Pro. Its chiclet-type keyboard is unsatisfying due to the lack of travel, and tends to get smudged

very easily. If you're a neat freak, the P35X V3 will drive you up the wall.

The machine also gets warm with use. We recorded an 84 degrees Celsius running temperature for the GPU, one of the hottest around for a single GPU system. The Aorus X7 Pro had a temperature of 85 degrees Celsius, which was expected because of its SLI nature. On the Gigabyte machine, it may come down to inadequate cooling for such a powerful GPU.

+
**Great performance.
Quality display.**

-
Very expensive.

The Gigabyte P35X V3 has the second lowest SSD capabilities in our shootout. However, it is also the only one besides the Aorus X5 to have a supplementary 1TB HDD to boost storage capacity.

Still, it should be noted that the P35X V3 is the most expensive machine here at \$4,299. Yes, the NVIDIA GeForce GTX 980M represents one of the most powerful graphics cards to have on a

notebook. Combined with a great display and an optical drive, the P35X V3 is a well-rounded powerhouse. However, both the Aorus X5 and ASUS ROG G501 offer dedicated features, be it performance or battery life, at a more palatable cost.

AT A GLANCE

Processor

Intel Core i7-4710HQ
(2.5GHz, 6MB cache)

Display

WQHD+ (2,880 x 1,620
pixels) LCD

Memory

16GB

Graphics

NVIDIA GeForce GTX
980M (8GB VRAM)

Storage

256GB SSD + 1TB

Price

\$4,299



Unlike the other notebooks, the Gigabyte has speakers that span the length of its base, which deliver powerful sound for notebook speakers.



The Gigabyte machine is the only notebook in the shootout that has an optical drive for physical discs.



HP OMEN

The HP Omen is HP's first foray back into the world of hardcore gaming after a long absence. Despite that, the HP Omen is one of the best looking gaming notebooks we've ever seen, 15-inch or not.

Its aluminum chassis feels great to touch. It's cool (both in temperature and looks) and gives the notebook a sturdy feel, which is a plus. The HP Omen is also one of the few gaming notebooks with a touchscreen.

The HP Omen's unique in that its Beats speakers line the sides of the device, instead of being at the top like ones found in other machines. While the speakers themselves are nothing special, they do deliver decent sound and convincing bass.

It's also only one that comes with customizable backlighting. The Omen has a utility that allows you to manage the colors on the keyboard and assign specific colors to custom sections. On top of that, you can customize shortcuts, both using the physical keys and the touchscreen. The touchscreen would come in handy on newer

versions of Windows and certain apps, but not much use in regular PC gaming.


The machine's build quality is excellent which impressed us a ton since the Omen is only going for \$2,299.

Sadly while the HP Omen is pleasing on the eye, it's a bit sluggish when it comes to showing what it can do. While the Omen's processor isn't bad, an older NVIDIA GeForce GTX 860M and lower RAM bogged down the unit. You'll get decent frame rates on average settings, but we won't recommend trying to play games on High or beyond.

Even if we look at longevity, the HP Omen's still bringing up the rear. The paltry 58Wh battery found in the HP Omen means it lasted just 98 minutes in our benchmarks and this is with the help of NVIDIA's Optimus technology.

We shudder to think what its battery life might be without it.

We're not ready to write the Omen off just yet though. HP has the design part of it down pat, they just have to make sure its hardware is up to snuff in the next iteration, or all will be for naught.


**Great looks.
Great build
quality.**


**Last generation
graphics card.**

AT A GLANCE

Processor

Intel Core i7-4710HQ
(2.5GHz, 6MB cache)

Display

Full HD (1,920 x 1,080
pixels) IPS touchscreen

Memory

8GB

Graphics

NVIDIA GeForce GTX
860M (2GB VRAM)

Storage

128GB SSD

Price

\$2,299



The HP Omen's hinge has a slight discoloration to it. It's actually a conscious design choice and not a manufacturing defect.



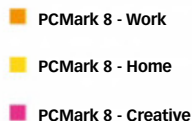
The HP Omen's base is different from the others in that it's slanted inwards instead of the usual rectangular shape. There aren't any stability issue though so don't worry about it being unstable.



PC Mark 8

(higher is better)

The Aorus x5 clearly showed its chops in PCMark 8, with results that put it in the lead of most of the benchmark tests.



AORUS X5 (5LI NVIDIA GEFORCE GTX 965M)



ASUS ROG G501 (NVIDIA GEFORCE GTX 960M)



GIGABYTE P35X V3 (NVIDIA GEFORCE GTX 980M)



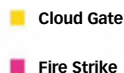
HP OMEN (NVIDIA GEFORCE GTX 860M)



3D Mark 2013

(higher is better)

It's clearly a race between the Aorus X5 and Gigabyte P35X V3 for the best performing card.



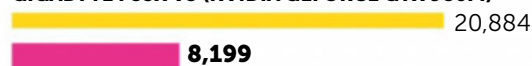
AORUS X5 (5LI NVIDIA GEFORCE GTX 965M)



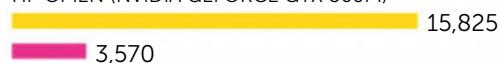
ASUS ROG G501 (NVIDIA GEFORCE GTX 960M)



GIGABYTE P35X V3 (NVIDIA GEFORCE GTX 980M)



HP OMEN (NVIDIA GEFORCE GTX 860M)



Middle Earth: Shadow of Mordor HD Textures Enabled (Ultra Only) (1920x1080)

(higher is better)

The Aorus X5 isn't performing as good as the Gigabyte machine, though the difference in performance issues (which may cause stuttering and tearing) can be mitigated by the Aorus' G-Sync monitor.



AORUS X5 (5LI NVIDIA GEFORCE GTX 965M)



ASUS ROG G501 (NVIDIA GEFORCE GTX 960M)



GIGABYTE P35X V3 (NVIDIA GEFORCE GTX 980M)



HP OMEN (NVIDIA GEFORCE GTX 860M)

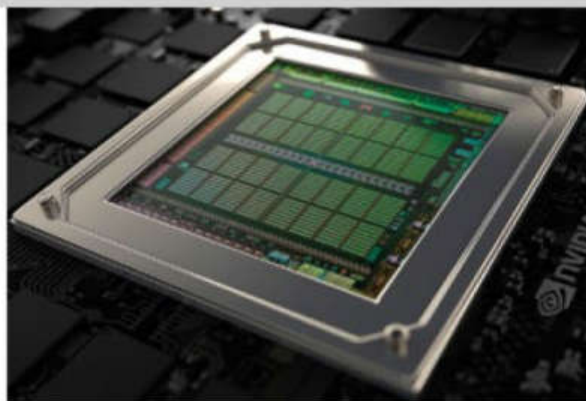




MODEL	AORUS X5	ASUS G501	GIGABYTE P35X V3	HP OMEN
PROCESSOR	Intel Core i7-5700HQ (2.7GHz, 6MB cache)	Intel Core i7-4720HQ (2.6GHz, 6MB cache)	Intel Core i7-4710HQ (2.5GHz, 6MB cache)	Intel Core i7-4710HQ (2.5GHz, 6MB cache)
DISPLAY	WQHD+ (2880 x 1620 pixels) IPS (G-Sync capable)	4K (3840 x 2160 pixels) LCD	WQHD+ (2880 x 1620 pixels) LCD	Full HD (1920 x 1080 pixels) IPS touchscreen
GRAPHICS	SLI NVIDIA GeForce GTX 965M (8GB VRAM)	NVIDIA GeForce GTX 960M (4GB VRAM)	NVIDIA GeForce GTX 980M (8GB VRAM)	NVIDIA GeForce GTX 860M (2GB VRAM)
RAM	16GB	16GB	16GB	8GB
STORAGE	M.2 512GB (256GB x 2 in RAID 0) SSD + 1TB HDD	512GB SSD	256GB SSD + 1TB	128GB SSD
BATTERY CAPACITY	73.26Wh	60Wh	75.81Wh	58Wh
DIMENSIONS	390 x 272 x 22.9mm	383 x 255 x 20.6mm	385 x 270 x 20.9mm	382.9 x 245.7 x 19.9mm
WEIGHT	2.5KG	2.06KG	2.3KG	2.12KG
PRICE	\$3,899	\$2,898	\$4,299	\$2,299

THE MAXWELL GPU ARCHITECTURE

NVIDIA cards all have their own unique code names based on their technology. Maxwell is NVIDIA's current generation architecture for CUDA applications. It introduces a new Streaming Multiprocessor design that improves energy efficiency, which means cards using the new architecture run on less energy while still delivering performance improvements over the older cards. Maxwell also includes improvements to a number of inner workings of the engine, which gives developers greater control over logic partitioning, workload balancing and other important aspects. The bottom line is that Maxwell gives developers greater control over more aspects of the architecture, which results in much improved performance for everything from gaming to daily GPU usage.



AND THE BEST 15-INCH SLIM GAMING NOTEBOOK



AORUS X5

While it may not be the clear winner, we have to give the nod to the Aorus X5. True, the machine does have performance issues, but we're comparing it against a NVIDIA GeForce GTX 980M, the best single GPU card on the market right now. Being a step behind the best, isn't great (especially if you're an SLI machine) but it's nothing to be ashamed of either.

On top of that, the Aorus X5 has many other admirable qualities. It has copious storage via its HDD and fast SSD storage courtesy of its SSDs in RAID 0 mode. But the tipping point comes from the fact that the machine is the only one with a display that comes with NVIDIA's G-Sync tech enabled, which no other notebooks in the shootout have.

While its price might not be an easy sell, it's still cheaper than the Gigabyte P35X V3 and is SLI to boot.



HANDY DRIVING COMPANION

TomTom Go 610

TomTom's new GO 610 personal navigation device is an incremental update upon last year's GO 600. The hardware is mostly the same as the GO 610 still comes with a large, bright 6-inch capacitive touchscreen display.

TomTom does not disclose specific details about the processor it uses though, but it feels snappy and responsive. Zooming in and out of maps is quick as far as personal navigation devices go. Its not as fast as today's flagship smartphones, but it doesn't feel too slow either.

We mentioned in past reviews that TomTom's user interface is one of the slickest to use and that hasn't changed. Menus are easy to navigate around as is destination input, so you can start driving quicker. While driving, the GO 610 features driving aids such as lane guidance and speed

camera alerts to help you stay safe.

Like its predecessor, the GO 610 features real-time traffic information via TomTom Traffic. This requires a data connection to work - achievable by tethering with your smartphone. For those worried about data usage, TomTom has mentioned that data use is almost negligible, claiming data use that's kept under 10MB per month even if you drove for an hour everyday in peak traffic.

TomTom Traffic does a good job of alerting you to any major traffic incidents on the road. And if it does spot one, it will automatically suggest a faster route for you. Unfortunately, it isn't spot on all of the time. There were instances of it being slow to update of new traffic jams; and there were also times where the traffic

has already cleared but the GO 610 still showed the road as being congested.

The new feature in the GO 610 is integration with TomTom's MyDrive app. Available as a free download for iOS and Android devices, the app lets you search for destinations and view traffic conditions before getting into your car. You can also opt to send your destinations ahead to the GO 610, allowing you to just get in and start driving.

At \$399, it's slightly pricier than its predecessor but that's also because it now comes with free lifetime update of maps worldwide. The older GO 600 only offered the same for eight countries around our region. All in all, the new GO 610 is a handy travel companion if you spend a lot of time on the road.

by Kenny Yeo

AT A GLANCE

Display
6-inch capacitive touchscreen

Resolution
800 x 480 pixels

Internal memory
8GB

Price
\$399



The magnetic Click & Go mount holds the device securely in the car.

CONCLUSION

The GO 610 is easily one of the best dedicated personal navigation devices for drivers today.

TESTED & RATED

8.0_{/10}

HWM
SINGAPORE

AT A GLANCE

Amplification
48 Watts Class D

Frequency range
55Hz-22kHz

Dimensions
175 x 112 x 145mm

Weight
1.5kg each

Price
\$500



NFC pairing is supported.

HALFWAY GOOD

Blue Aura X30

Blue Aura is a relatively new name here; the British company was set up in 2010 by audio industry veteran Nick Holland and focuses mostly on audio systems that are either wireless or wireless-ready, allowing for simple set-up of indoor entertainment systems.

If you look at the website, you'll find a wide range of wireless speakers, ranging from single-unit table-top Bluetooth speakers to subwoofers and even tube amplifiers and a wireless transmitter. The X30s are priced between the entry-level WS30i and the high-performance WS80i, and so can probably considered

a mid-range system best suited for pairing with laptops and computers.

The speakers themselves are fairly compact in size and weigh around 1.5kg each. While the speakers stream audio wirelessly, they connect to each other by way of Blue Aura's 'Quick Connect' cable, which has a standard RJ-45 lead. To expand connectivity, you can also purchase Blue Aura's WST wireless transmitter, which acts as a hub for multi-room functionality.

The speakers boast amplification of 48W and a frequency range of 55Hz to 22kHz. Bluetooth 4.0 with aptX is used for an optimal streaming experience,

and NFC is available for one-touch pairing, and the inputs at the rear of the right speaker allow you to plug in more traditional inputs like optical digital and stereo RCA analog. There's also a subwoofer output if you need more bass; Blue Aura has the xSub for this purpose, but that's going to cost you another \$500.

The X30s come in a faux leather finish, and are available in a choice of White, Black or Sahara. We only had the Black pair, but we think all the colors should match nicely with most modern interiors, and must say that the faux leather finish adds a touch of class to the entire package.



PICTURES BLUE AURA



A wide variety of inputs are supported too.

CONCLUSION

A competent speaker that needs a bit more tuning to be truly great.

Starting our audition with a recording of Spanish Harlem by Rebecca Pidgeon, we felt the speaker did a fairly good job with the intro, rendering Pidgeon's vocals with a slight bit of warmth and a great deal of smoothness. We felt that the piece could have done with more separation though, but that the speaker generally turned in a good performance.

Moving on to a recording of Grandma's Hands by Livingston Taylor again reinforced the idea that this speaker does well with the midtones, giving an enjoyable rendition of the trio. However the track is one that tests for naturalness, and that's where the speaker falters a bit as details like the snapping of fingers are a little lost in the presentation.

Moving on to our standard

test tracks, the X30 turned in a delivery on Adele's Melt My Heart to Stone that was slightly more neutral than we would have liked. Adele's vocals had just about enough weight to not be overwhelmed by the backing instruments, but we do feel like the performance could have done with a touch more warmth.

Tiesto's Elements of Life showed us again the promise of the X30, as it quite handily matches the attack on this fast moving piece. The bass line packed a decent punch, but the bass extension on this speaker is lacking a little, so there isn't the depth to get you moving. The mid-section of Elements of Life is a fairly good test of sound stage, and in this case we have to say we were unfortunately left wanting.

We do think that pieces

with more focus on the mid to top end serve this set of speakers better though. For example, Buckethead's Sail On Soothsayer features a fair amount of detail in the upper mid to high notes, and that subsequently allowed the X30 to deliver one of its better performances. Good detail on the high end, and good execution with the solo would be our takeaways, though we would like a bit more body on the piece.

Finishing off with The Eagles' Hotel California, the X30 again reinforced our impression that it is very much a balanced sounding pair of speakers, with the sweet spot firmly in the mid range. While there was a good amount detail in the intro, we did feel that the bass was again a bit lacking on this piece. We have liked it if Don Henley's vocals were a bit more forward in the presentation as it did get lost amongst the instruments at times. Still, the rendition was enjoyable overall.

by *Marcus Wong*

TESTED & RATED

7.5_{/10}

HWM
SINGAPORE

A CONSOLE-INSPIRED PC

ASUS ROG GR6

AT A GLANCE

Processor

Intel Core i5-5200U @ 2.2GHz with 3MB L3 cache

Graphics

NVIDIA GeForce GTX 960M

Memory

8GB DDR3 SO-DIMM

Price

\$1,399



There is space for an additional 8GB SO-DIMM.

CONCLUSION

A decent portable 1080p gaming machine, but only if you are satisfied with just-playable frame rates.

In the rarefied spheres of hardcore gamers and enthusiasts, size has sometimes become synonymous with performance and power. However, casual gamers probably prefer a more easily accessible and stylish system that delivers playable frame rates on modern games. For them, they simply don't need the extra space for multi-GPU setups or E-ATX motherboards.

The ASUS ROG GR6 meets this demand, coming in a svelte 2.5L chassis decked out in the signature red-and-black ROG color scheme. It is equipped with an NVIDIA GeForce GTX 960M mobile graphics card, so you're better off looking elsewhere if you want desktop graphics performance.

The processor is a dual-core Intel Core i5-5200U CPU, with a base speed of 2.2GHz and a Turbo Boost speed of up to 2.7GHz. The U suffix marks it as an ultra-low power part, with a Thermal Design Power (TDP) of just 15 watts. This is an odd choice for a gaming-oriented machine – the same CPU is found on ultrabooks like the Dell XPS 13 – and we're guessing the decision had something to do with reducing heat output in such a compact chassis.

The ROG GR6 is really more of a portable console than a full-sized desktop. As if to further highlight this fact, ASUS has included a dedicated Steam Big Picture

launcher button on the front panel, providing quicker access to Steam's interface designed for use with TVs and game controllers.

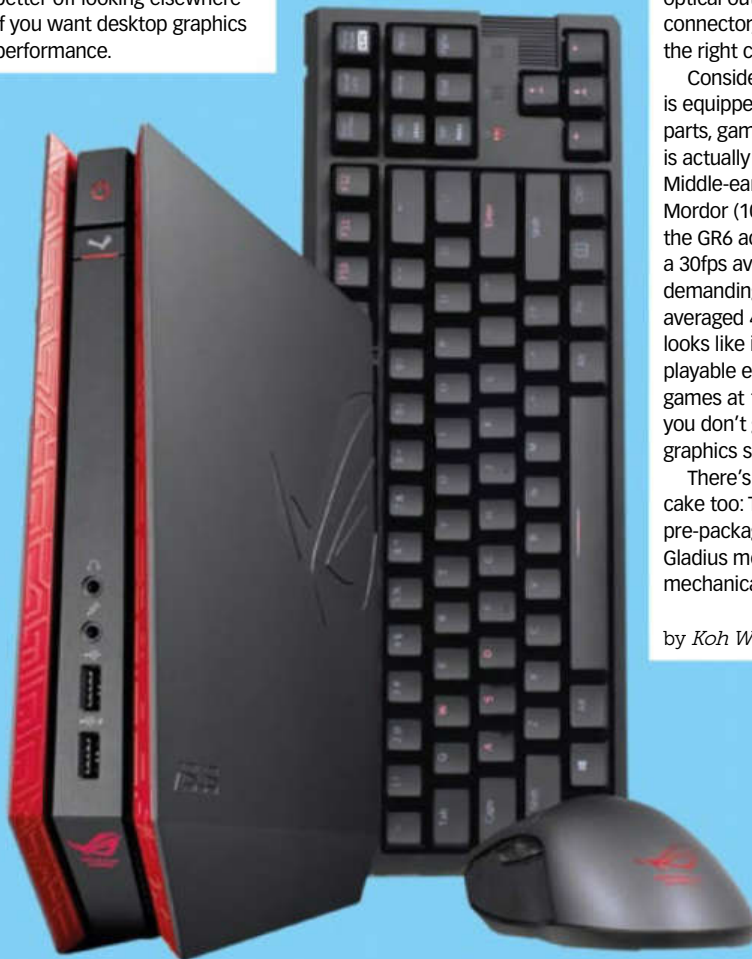
It does have one advantage over traditional consoles though – the right side panel can be removed for easy user upgrades. The SO-DIMM and hard drive bays sit right below, and you can add an additional SO-DIMM module or 2.5-inch SSD/HDD. Our unit came with a single 8GB DDR3L-1600MHz SO-DIMM (upgradeable to 16GB) and a 1TB HDD.

Around the back, the GR6 has four USB 3.0 ports, one HDMI output, a DisplayPort connector, one Intel Gigabit Ethernet port, and one S/PDIF optical out. There is no DVI connector, so be sure to have the right cables on hand.

Considering that the GR6 is equipped with notebook parts, gaming performance is actually fairly decent. In Middle-earth: Shadow of Mordor (1080p, Ultra settings), the GR6 achieved just over a 30fps average. On the less demanding High settings, it averaged 44.55fps. Overall, it looks like it should deliver a playable experience on most games at 1080p, provided you don't go crazy with the graphics settings.

There's the icing on the cake too: The GR6 comes pre-packaged with a free ROG Gladius mouse and M801 mechanical keyboard.

by Koh Wanzi



TESTED & RATED

8.0_{/10}

HWM
SINGAPORE



A TAMED FURY?

ASUS Strix Radeon R9 Fury

While the Radeon R9 Fury X might have been about AMD putting its best foot forward, the Radeon R9 Fury is about giving consumers more choice. Unlike the Fury X which is available only in reference designs from add-in card manufacturers, the air-cooled Fury comes in many flavors from different manufacturers.

But while the Fury X's Fiji GPU had 16 Compute Units (CUs) per Shader Engine for a total of 64 CUs, two of these are disabled per Shader Engine on the Fury. This means that the number of functional CUs is down to 56, and the number of shaders has also been reduced to 3,584.

The core clock has also been taken down to 1,000MHz, but the 4GB of HBM is still clocked at 1,000MHz as on the Fury X. It also has the same 512GB/s of memory bandwidth, which

should stand it in good stead at high resolutions and when anti-aliasing is turned up. The ASUS card comes with an OC mode, which nudges the core clock up to 1,020MHz.

The card itself sports a triple-fan DirectCU III cooler and a full-length metal backplate for extra rigidity. It looks like ASUS has gone with a completely custom PCB that spans the entire length of the backplate and heatsink fins. In comparison, cards from Sapphire and PowerColor hew closer to the reference PCB with a shorter design that allows the cooler to extend beyond the PCB and backplate.

In our benchmarks, the Fury turned up numbers that were fairly close to that of the Fury X. The Fury performed best in memory-hungry situations, falling behind the GeForce GTX 980 in less demanding games like Tomb Raider.

Furthermore, it faced the same overclocking limitations as the Fury X. Memory overclocking is locked, and we were able to hit an overclock of just 1,070MHz, which translated into a small 6% gain in 3DMark 2013. We recorded a peak temperature of 68°C, which is actually quite decent compared to the reference GeForce GTX 980 Ti.

The ASUS Strix Radeon R9 Fury may look like it struggles against the GeForce GTX 980 in some benchmarks, but we find that it ultimately starts gaining an advantage in newer games and resolutions exceeding 1080p. If you are a hardcore tweeker, a custom GeForce GTX 980 solution still seems to be a better choice, but we're very impressed with the forward-looking Radeon R9 Fury for its price-to-performance efficiency.

by Koh Wanzhi

AT A GLANCE

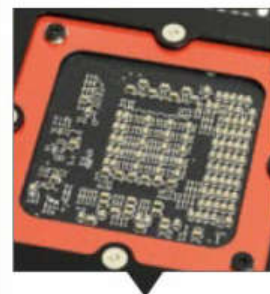
GPU Transistor Count
8.9 billion

Core Clock
1,000MHz

Memory
4GB HBM

Memory Clock (DDR)
1,000MHz

Price
\$969



The red GPU Fortifier brace provides dedicated support to the GPU die.

CONCLUSION

Get the best advantages of the Fury X – lots of memory bandwidth and performance at high resolutions – at a cheaper price? We'd chalk that up as a win.

TESTED & RATED

9.0_{/10}

HWM
SINGAPORE

AT A GLANCE

Wireless

802.11 ac/b/g/n/a

Frequency bands

2.4GHz and 5GHz

Ports1 x USB 3.0, 1 x USB 2.0
/eSATA combo**Price**

\$399



There's a USB 3.0 port and USB2.0/eSATA combo port that can be used for connected external storage devices and other peripherals like printers.

CONCLUSION

The router is speedy but its potential can only be realized by compatible clients.

TESTED & RATED

8.5/10

HWM
SINGAPORE

HERALD THE FUTURE OF WI-FI

Linksys EA8500 MaxStream AC2600

The Linksys EA8500 is the first consumer MU-MIMO router. MU-MIMO refers to Multiple-user Multiple Input Multiple Output, a new technology that aims to improve overall network performance by allowing simultaneous device connectivity (*You can read more about MU-MIMO technology in this month's Learn section*).

At first glance, you are probably thinking that you have seen the EA8500 before. This is because it looks almost identical to the older E8350. The only notable differences are much larger antennas and a lighted Linksys logo on the front panel that serves as a rudimentary status indicator.

Behind the router are the usual assortment of ports including four Gigabit Ethernet LAN ports, a Gigabit Ethernet WAN port, a USB 3.0 port and a USB 2.0/eSATA combo port. There's also a button for

WPS and another button that instantly turns off the Wi-Fi network.

The EA8500 is powered by a dual-core Qualcomm IPQ8064 processor running at 1.4GHz, which is complemented by 512MB of RAM and 128MB of flash. Enabling its support for MU-MIMO is Qualcomm's QCA 9980 MU | EFX chipset. The chipset is used on both the 2.4GHz and 5GHz radios and supports four spatial streams on both frequency bands. This means a data transfer rate of up to 1,733Mbps on the 5GHz band and 800Mbps on the 2.4GHz band.

Setup was a breeze; if you've used any other Linksys Smart Wi-Fi router before, you'll know what to expect. For those unfamiliar, Smart Wi-Fi offers a good balance of ease of use and control, with advanced features such as traffic monitoring, QoS, parental control, cloud storage and

more. Everything is clearly labeled and options and features are easy to find.

As for performance, the Linksys EA8500 is right up there with fastest routers in the market. If we were to nitpick, we would say that its downlink speeds are a little shaky and its stability at extreme ranges not as strong. But generally speaking, performance is top notch. Enabling MU-MIMO with compatible devices also resulted in about a 30% increase in performance overall.

The Linksys EA8500 represents the very cutting-edge of wireless technology and comes highly recommended for enthusiasts who demand the latest and the very best. But remember, the advantage of MU-MIMO can only be fully realized with new and compatible client devices.

by *Kenny Yeo*

HAWAII REBOOTED

MSI Radeon R9 390X Gaming 8G

The MSI Radeon R9 390X Gaming 8G hews close to the design we're used to seeing on most cards with MSI's excellent Twin Frozr V cooler.

The card is a rebrand of the Hawaii XT GPU found on 2013's Radeon R9 290X. Now going by the strapping new Grenada XT moniker, it's still a Hawaii GPU at heart, which means it runs quite hot and guzzles power.

However, core and memory clocks have been bumped up, along with the GDDR5 memory capacity. The MSI Radeon R9 390X has an out-of-the-box core clock of 1,080MHz and effective memory clock of 6,000MHz. It's also equipped with an impressive 8GB of GDDR5 memory, second only to the 12GB on the NVIDIA GeForce GTX Titan X.

As it turns out, this additional memory capacity – which translates into 384GB/s of memory

bandwidth – helps the card outperform its competitors in bandwidth-hungry games like Middle-earth: Shadow of Mordor. At a resolution of 2,560 x 1,600 with Ultra settings, the MSI card was almost 11% faster than the Gigabyte GeForce GTX 980 G1 Gaming.

When it came to power consumption, the Radeon R9 390X had a peak power consumption of 417 watts, a fair bit higher than the Gigabyte GeForce GTX 980 G1 Gaming's 304 watts. It also ran quite hot at 73-degrees Celsius, the same as its predecessor, the Radeon R9 290X.

Unfortunately, the card was also quite a poor overclocker. We managed to hit a core clock of 1,130MHz and effective memory clock of 6,480MHz, just a small 5% and 8% increase over stock speeds respectively. This resulted in just a 4% increase in scores in

3DMark, compared to the 10% the GeForce GTX 980 managed to achieve.

Build quality-wise, the card's PCB is protected by a sturdy matte-finish metal backplate adorned with the MSI dragon insignia. As this is actually a fairly heavy card, we're happy to see the extra structural support here.

Round the back, the card has two DVI-D ports, one HDMI port, and one DisplayPort connector. Power is delivered by one 6-pin and one 8-pin connector.

Wrapping up on the aesthetics front, the card lets you add custom lighting effects to the MSI Gaming Dragon insignia at the card's side. There aren't too many options, but you get to take your pick from effects like "Breathing" or "Flashing" in the MSI Gaming App.

by Koh Wanzhi

AT A GLANCE

GPU Transistor Count
6.2 billion

Core Clock
1,080MHz

Memory
8GB GDDR5

Memory Clock (DDR)
1,500MHz

Price
\$749



The MSI Gaming Dragon insignia can be customized with a variety of lighting effects.

CONCLUSION

A decent card for the money, but only if you're gaming at quad HD resolutions.



TESTED & RATED

7.5_{/10}

HWM
SINGAPORE

THE BEST PHABLETS MONEY CAN BUY

Samsung Galaxy Note 5 & S6 Edge+

NOTE 5

OS

Android 5.1.1

Display

5.7-inch flat Super AMOLED, 2,560 x 1,440 pixels

Dimensions

153.2 x 76.1 x 7.6mm

Weight

171g

Price

\$1,088 (32GB)
\$1,188 (64GB)

S6 EDGE+

OS

Android 5.1.1

Display

5.7-inch curved Super AMOLED, 2,560 x 1,440 pixels

Dimensions

154.4 x 75.8 x 6.9mm

Weight

153g

Price

\$1,188 (32GB)
\$1,288 (64GB)



The new Samsung Galaxy Note 5 and S6 Edge+ are cut from the same cloth as the smaller S6 and S6 Edge that we first saw in March. They all sport Gorilla Glass protecting the front and back, a strengthened metal frame, a 16-megapixel, optically stabilized rear camera and 5-megapixel front camera, a fingerprint-sensing Home button, a heart rate monitor at the flash area that doubles as a shutter button for selfies, support for not one but two wireless charging standards,

a super-fast Exynos octa-core processor, speedy UFS 2.0 storage, and LPDDR4 RAM. If you're looking for differences, the Note 5 and S6 Edge+ have a bigger screen (5.7-inch, Quad HD), a faster charging rate (even for wireless charging), and more RAM (4GB).

The Note 5 and S6 Edge+ don't look identical, of course. The former has a flat screen and curved back; the latter a curved screen and flat back. Either way, both phones look great and feel great. If I'm allowed to nitpick, it will be that

camera bulge at the rear. There was talk before this that Samsung would switch to a new, slimmer camera module to get rid of this unsightly protrusion, but that didn't materialize. Both are also giant fingerprint magnets, especially the back, which won't really be an issue if you use a case.

The decision to stick with the S6's design also sealed the fates of the removable battery and expandable storage. The latter's omission is made all the more glaring because, unlike the smaller S6

models, both phablets don't come with a 128GB version. If you can't live without the ability to swap batteries or carry more than 54GB worth of personal files, then you may have to turn to other makers' flagships. For example, the LG G4 still packs a user-replaceable battery, and the new Moto X Style still carries a microSD card slot.

That said, the 3,000mAh battery that both devices are using is no slouch. In my video playback test, the Note 5 lasted 14 hours and 50 minutes; and the

S6 Edge+ 15 hours and 10 minutes. These numbers are better than what I've gotten on the Note 4. Also, I've had no problems reaching five hours of screen-on time, with juice to spare at the end of a long day.

Despite the various similarities, the two phablets target very different types of users. And it boils down to whether you prefer the Note 5's S Pen, or the S6 Edge+'s sloping display. Like previous Notes, you can use the S Pen (which now has a spring-loaded tip for easy ejection) for scrolling, navigating the UI, highlighting text, taking notes, and splitting screens for multitasking. New features this time round include Scroll Capture, which lets you screen-capture a long webpage and then annotate it afterwards; PDF writing using both

pen and finger; and Screen Off Memo, which lets you start writing on the screen the moment you eject the S Pen. You can also add up to three third-party app shortcuts to the Air Command contextual menu.

On the other hand, the stylus-less S6 Edge+ attempts to win you over with several software tricks designed specifically for the curved display. Like the smaller S6 Edge, there's the Information Stream, which displays information like weather, time, and notifications on the curved edges; and the People Edge, which gives you a row of five colored contacts who you can quickly call, text, or send emails to. The latter is now enhanced with additional means to connect with your assigned contacts. After turning on Samsung's OnCircle service,

you can communicate with your friends via handwritten messages, images, emoticons and pokes. Being able to see who's calling when the phone is face-down on the table based on the color that peeps out from the curved sides, and then reject the call and send a quick reply with a touch on the heart rate sensor continues to be my favorite dinner table trick.

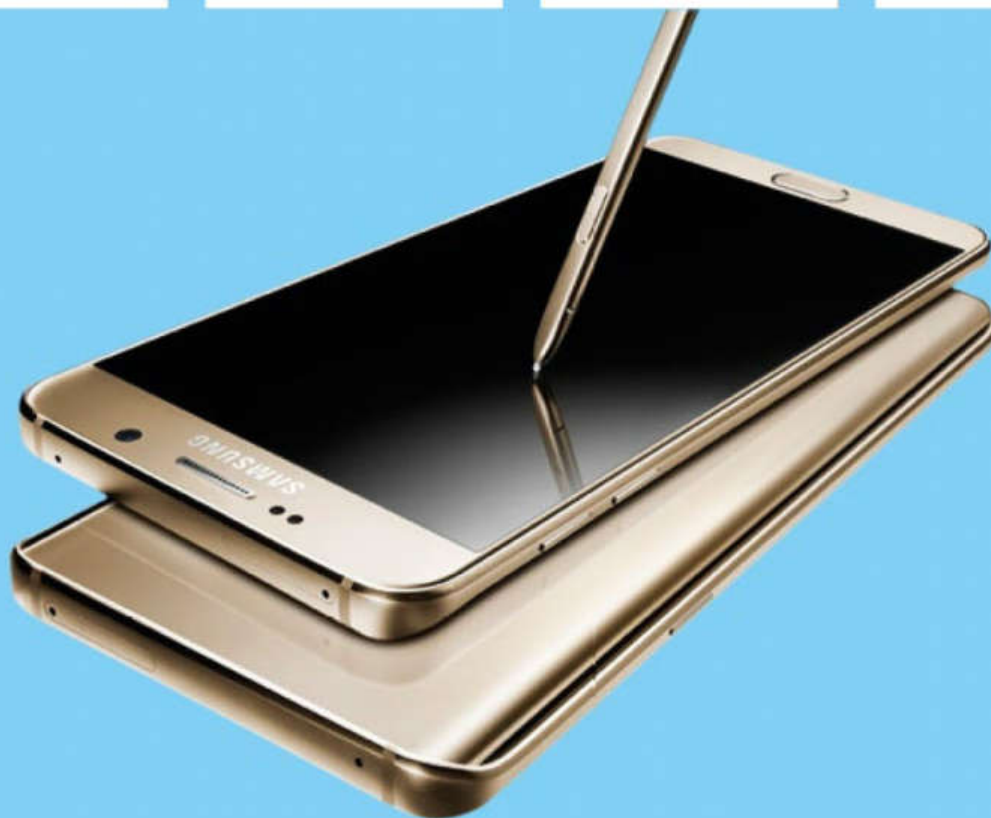
Both the Galaxy Note 5 and S6 Edge+ are powered by Samsung's in-house Exynos 7420, an octa-core SoC fabricated using a 14nm process. Based on ARM's big.LITTLE configuration, it has four Cortex-A57 cores clocked at 2.1GHz and four Cortex-A53 cores at 1.5GHz. The GPU continues to be a Mali-T760 MP8. If all these sound familiar, that's because the Exynos 7420 is also used in the smaller



Both phablets have a 16MP, optically stabilized rear camera that's great at low light shooting.



The Note 5's S Pen is the most accurate stylus Samsung has designed to date. Feels great too.



Galaxy S6 and S6 Edge.

Performance-wise, the phablets aced most of our benchmark tests. Their JavaScript performance (around 350ms) in SunSpider is every bit as good as the iPhone's; and in the GPU department, their 3DMark Ice Storm Unlimited scores (in the region of 25,000) are class-leading. Synthetic benchmarks aside, in the real world, both phablets ran all sorts of tasks I threw at them with nary any hiccups, and responded very quickly to touches. Much of this credit has to go to

the pared down TouchWiz layer. That said, RAM usage can do with a bit more optimization, so that apps or data (e.g. Chrome tabs) don't need to reload so often.

For the cameras, it's mostly a software story too. The Camera app's Pro mode now lets you save photos as RAW files and manually adjust the shutter speed between 1/24,000 and 10 seconds. Videos should also appear less shaky due to improved software-based video stabilization. Last but not least, you can

combine multiple videos (including slow-mo footage) into a video collage, and stream a live feed in full HD straight from the camera to YouTube. Add all these to the fast startup (just double-press the Home button), high sensitivity, and a class-leading image quality, and you've two of the best Android camera phones in the market today.

Between the two phablets, I'll say go for the Note 5 for its better value. Because despite packing a stylus, it's \$100 cheaper than the S6 Edge+. It's also slightly more

comfortable to hold due to its curved back. But that's not to say the S6 Edge+ is inferior. Even without a stylus, its design, features, and performance are still head and shoulders above most of its competitors. Sure, there are new phablets these days that are ticking more spec checkboxes than recent Samsung devices and cost quite a bit lesser; but in general, I still find Samsung flagships better built and have fewer edge cases to deal with.

by Ng Chong Seng



NOTE 5
9.0_{/10}
HWM
SINGAPORE

S6 EDGE+
9.0_{/10}
HWM
SINGAPORE

CONCLUSION

Both are excellent performers, but the Note 5 offers better, more practical value as it's cheaper and has the S Pen.

SSD FOR BARGAIN HUNTERS

ADATA XPG SX930

AT A GLANCE

Controller

JMicron JMF607H

Memory

128Gbit Micron
MLC NAND

Interface

SATA 6Gbps

Price

\$159



The SSD Toolbox utility lets you easily upgrade the drive's firmware and monitor its health status.

CONCLUSION

The drive offers average performance, but redeems itself somewhat with a 5-year warranty and attractive pricing.

The ADATA XPG SX930 is the company's new flagship drive and was designed specifically for gamers. In case you were wondering, XPG stands for "Xtreme Performance Gear".

ADATA calls the NAND used in the XPG SX930 "Enterprise-grade MLC Plus NAND" and is so confident of its quality that it is offering a 5-year long warranty. To boost performance, the XPG SX930 also has what ADATA calls "pSLC Cache Technology", where a portion of the NAND die is dedicated to operate in SLC mode to improve random write performance.

However, the highlight of drive must be the use of JMicron's new JMF607H controller. JMicron is no stranger to the SSD business

and has been producing controllers for SSDs as early as 2008. However, while ADATA has positioned the XPG SX930 as their flagship drive, specifications for the JMF607H controller suggest otherwise. The controller supports just four NAND channels and uses a low-power single-core ARM968 processor, and looks more at home in a drive targeted at mainstream users.

Sure enough, performance wasn't stellar in our benchmarks. Sequential read and write speeds were generally good, but its performance, especially when it came to intensive workloads with high queue depths, was lacking. Read speeds, in particular, took a serious hit whenever we

increased queue depth. Write speeds, on the other hand, held up quite well, presumably thanks to ADATA's pSLC Cache Technology, but it's not quite enough. Other drives in the same price bracket - such as the Samsung SSD 850 Evo and Plextor M6S - continue to outperform it. Overall, its performance can best be summed up as mediocre.

Priced at \$159 for the 240GB variant tested, the XPG SX930 finds itself somewhere in the middle of the pack - much like its performance characteristics. And therein lies its biggest problem. Samsung's very excellent SSD 850 Evo retails for only \$10 more. Its overall performance and matching 5-year warranty makes it a tremendous value in the mainstream SSD space compared to the XPG SX930.

After all things considered, the XPG SX930 is a rather average drive. It does have redeeming qualities as one of the few drives with a 3.5-inch HDD adapter, competent software and cloning utilities. If you have to save that \$10, the ADATA XPG SX930 is still a decent drive, but is the trade-off worth it?

by Kenny Yeo



TESTED & RATED

7.0_{/10}

HWM
SINGAPORE

AT A GLANCE

Sensor

APS-C X-Trans II CMOS

Megapixels

16.3-Megapixels

Dimensions

118.4 x 82.8 x 40.8mm

Weight

331g (body only)

Price

\$1,299 (body only)



Images can be taken at up to ISO 12,800 and with enough details intact to remain usable.

THE LITTLE CAMERA THAT COULD

Fujifilm X-T10

The X-T10 comes slightly more than a year and half after the company's flagship X-T1 camera, and according to Fujifilm, incorporates a lot of the feedback they have had received from early users of the X-T1. It's a mid-class camera that targets the younger generation, but should still draw plenty of attention from photographers of all ages because of its gorgeous retro styling.

The X-T10 inherits the 16MP X-Trans CMOS II sensor and EXR Processor II from the X-T1 and gains an AF system that was actually better than that in the X-T1 (until a recent firmware update brought them up to

par). It's not weather-sealed though, which was a key selling point of the X-T1, but of course that benefit only worked if the camera is paired with weather-sealed lenses.

The X-T10 is also a lot more affordable than the X-T1 was at launch, so you could say that it is a slightly stripped down but still entirely capable prosumer camera that hits the sweet spot in terms of price versus feature and quality.

So what's changed from the X-T1 to the X-T10? Well, at just 381g, the camera is slightly lighter compared to the 440g of its older sibling, and at 118 x 83 x 41mm, it's also slightly smaller (the X-T1 measures 129 x 90 x 47mm).

The viewfinder is also slightly smaller, with 0.66x magnification versus 0.77x on the X-T1. This means you won't be able to use the dual image function from the X-T1, but the good thing is that the X-T10's Electronic Viewfinder (EVF) lag time is on par with the X-T1 at just 0.005 seconds, giving you one of the more responsive EVFs in the market.

Colors are again fairly true to life, so we didn't miss not having an optical viewfinder. One of the advantages of having an EVF is that any exposure/white balance adjustments you dial into the camera will be reflected in the viewfinder, so it's practically like shooting in live view mode with the





Flicking this switch to "On" engages full automatic mode.

CONCLUSION

Smaller, lighter, but packs just as much punch as the X-T1. A great combination of value and performance.

advantage of holding the camera up to your face, as opposed to holding it arm's length.

In terms of menu systems, there's no change from the X-T1. The Quick menu is imported over to the X-T10, which means you can easily adjust most settings from there. In fact, no less than 27 options can be assigned to the Quick menu, so this is one camera that you can certainly customize to be just the way you want it.

In terms of physical controls, the X-T10 is quite a bit more streamlined than its older brother. Drive modes are now combined with the mode dial. The dial for adjusting ISO sensitivity as well as the one for metering modes are both gone, but they can be set to the aforementioned Quick menu, which is just as accessible in practice.

The final difference from the X-T1 is that there is now

dedicated switch to put the camera in "Auto" mode (or Advanced SR Auto mode as Fujifilm calls it). Fujifilm explains this as a provision for the times when you want to hand the camera to someone else to quickly take a photograph for you, yet want to be certain the photo will at least be properly exposed.

Simply put, taking pictures with the X-T10 is a joy. Paired with the XF18-55 kit lens, the camera feels to be just about the right size and weight to bring anywhere with you, and you certainly get your fair share of admirers when you pull it out. The X-T10 is extremely responsive, and once you set up the Quick menu, your most accessed functions can be changed from just one screen.

Thanks to its improved autofocus system which gives you 49 focus points on a 7x7 grid across the entire frame in single focus point

mode and an even wider 77 areas on a 11x7 grid in Zone AF and Wide/Tracking AF modes, getting your focus on just the right spot fairly easy.

Much like with the X-T1 before it, images are vibrant with color. Dynamic range is also quite impressive to say the least, with plenty of detail that can be brought out in post. The high ISO performance is also very good, with images taken at ISO 12,800 usable straight out of camera. Another winner for sure.

by *Marcus Wong*

TESTED & RATED

9.0_{/10}

HWM
SINGAPORE

AT A GLANCE

GPU Transistor Count
5 billion

Core Clock
990MHz

Memory
2GB GDDR5

Memory Clock (DDR)
1,375MHz

Price
\$399



The card is powered by a single 8-pin PCIe power connector.

CONCLUSION

Good bang for your buck, but try not to go beyond 1080p resolutions.

TESTED & RATED

7.5_{/10}

HWM
SINGAPORE



NEW CARD FOR THE MAINSTREAM

ASUS Strix Radeon R9 380

The ASUS Strix Radeon R9 380 is based on AMD's Tonga GPU architecture, which first debuted on the Radeon R9 285 late last year. As a rebadged card, it now features higher core and memory clocks. In the case of the ASUS card, the card ships with a 990MHz core clock and 5,500MHz effective memory clock.

This particular model ships with just 2GB of GDDR5 memory. When combined with a 256-bit memory bus, this translates into just 176GB/s of memory bandwidth. We find it a little strange that AMD released a 2GB variant of the card, given that AMD explicitly stated at its E3 launch announcement that the Radeon R9 380 is designed to handle 1440p resolutions comfortably.

The ASUS card is equipped with a dual-fan DirectCU II cooler and a

solid metal backplate that we really like. The brushed metal plate confers a pleasant heft and prevents the PCB from flexing. And as is the standard order these days, the cooler utilizes semi-passive fans that stop spinning entirely under low loads, making for a far quieter experience.

The selection of display connectors is as expected, comprising one DVI-I port, one DVI-D port, one HDMI output, and a DisplayPort connector.

Power is delivered to the card via a single 8-pin connector, a change from the 2x 6-pin design on the reference card. There is also an LED light above the PCIe power connector that glows red when there's a faulty connection or no power, and white when all is well. This should certainly help rule out loose connections when troubleshooting.

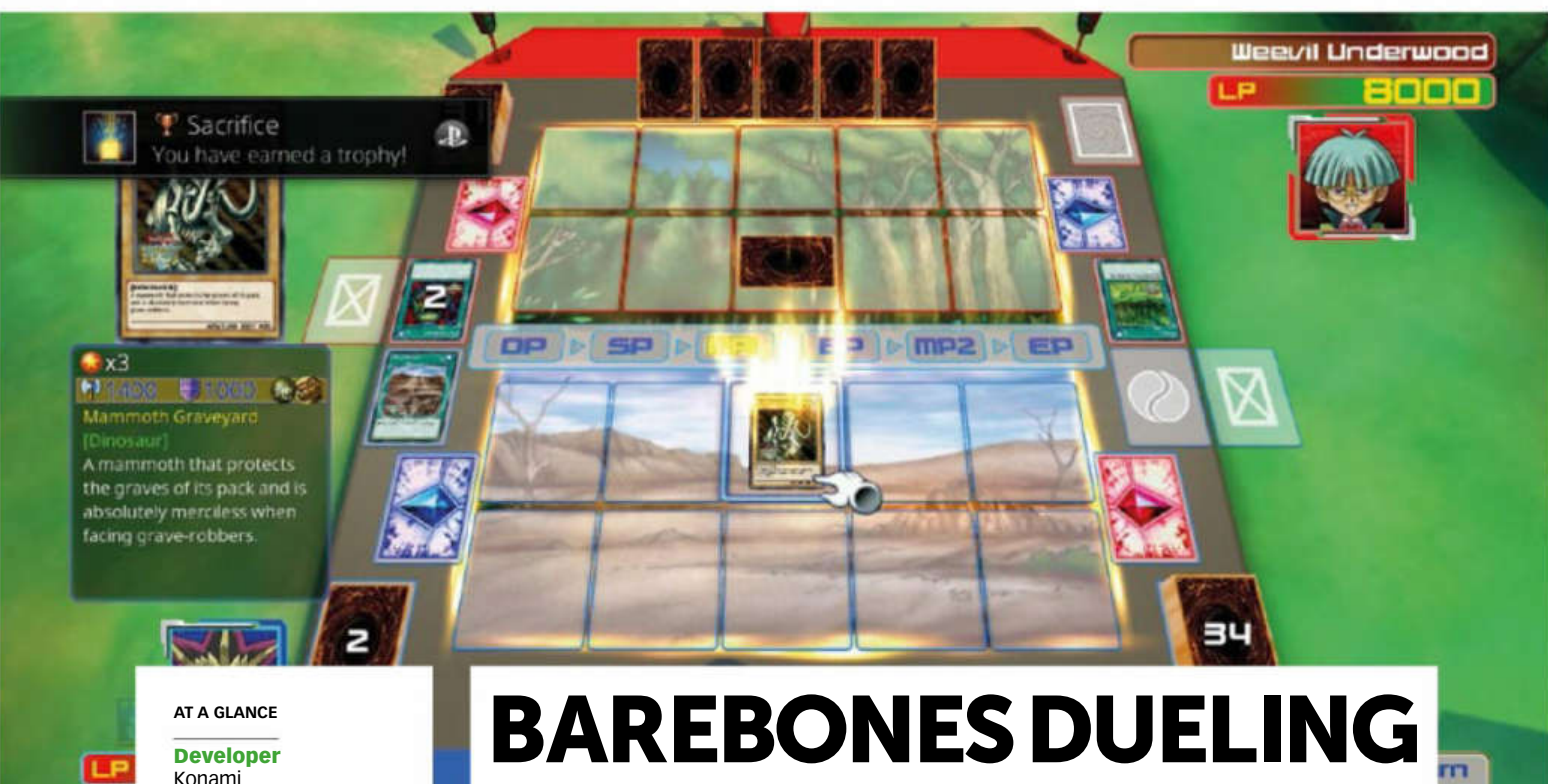
In Middle-earth: Shadow

of Mordor, the limitations of having just 2GB of GDDR5 memory were clearly apparent. The card averaged just 26.47fps at 1600p and Ultra settings, and was 63% slower than last generation's Radeon R9 280X. Things were set back on a more even keel in Crysis 3, where it was on par with the Radeon R9 280X at 1600p (Ultra settings, no AA).

When it came to overclocking, the card did decently enough, managing a core clock of 1,110MHz and effective memory clock of 5,800MHz. This equated to an 8% to 12% gain across all three 3DMark benchmarks.

If you'd like a comparison with the green camp, the ASUS Strix Radeon R9 380 slots right between the NVIDIA GeForce GTX 960 and 970 in terms of performance, but at a price far closer to the GeForce GTX 960.

by Koh Wanzhi



AT A GLANCE

Developer
Konami

Publisher
Konami

Genre
Card Game

Platform
PS4 and Xbox One

Players
1 – 2 (Multiplayer is online only)



The booster pack store is disappointingly spartan and confusing. You don't even know what cards you can expect to get from the characters.

CONCLUSION

It gets the dueling part right, but not much else.

BAREBONES DUELING

Yu-Gi-Oh! Legacy of the Duelist

As both a TCG and video game player, Yu-Gi-Oh! Legacy of the Duelists scratches a few itches at once. It delivers on the stories from the various animes in the series (only Arc V isn't represented) while providing context to the duels you're fighting. It even offers 'Reverse Duels'. For example, in Yugi's first duel against Kaiba, you're given control of Yugi and his Exodia deck. Beat that duel and you get a bonus, you can now play as Kaiba against Yugi. How neat is that?

Despite this, there's still a certain lack of direction to the game. Unlike the seminal PSP 5D's games, you can't control an avatar and walk around town challenging random people. You're stuck with the story duels or if you prefer, challenges with the duelists. There's nothing to do other than dueling.

While the game has a bewildering array of cards (over 6,000), including Arc V, which means Pendulum Summons are in, the

developers have managed to suck all the joy out of collecting them. You earn points by dueling and purchase boosters from characters you unlock through the campaign. However, there's no indication of what type of card comes from which pack. For example, if you are specifically trying to get Blue Eyes White Dragon, do you focus on Kaiba or Granpa boosters? There are also no themed boosters either this time round.

The game then introduces Battle Packs Sealed and Draft play modes where you're given a set of random cards and to battle; fun yet limiting due to the random factor. Meanwhile, other features from past games such as tag duels are absent.

The single noticeable improvement over its predecessors is game speed. AI takes turns faster now, so duels move along smoother. While the interface is pretty much the same as it was in previous games, there's still

a distinct lack of animation as only some cards have their own battle animations and models. This has been an issue on the portable games for ages and it's sad to see that even the move to a current generation console can't get us unique spell effects and character models for each individual card.

Legacy of the Duelist is an incredibly disappointing game. This is Konami's chance to start afresh on a new round of consoles and show off what the series can do, but it's barely a step up from its previous incarnations.

by Salehuddin Husin

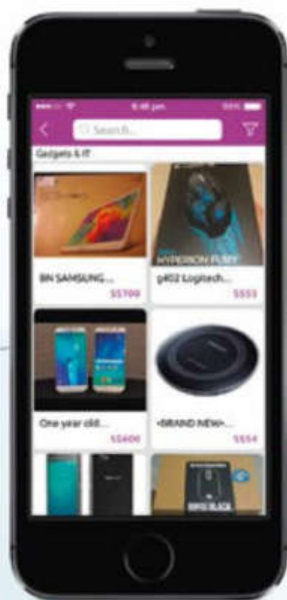
TESTED & RATED

5.0_{/10}

HWM
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LEARN

GET ANDROID ON YOUR PC

■ If the PC is good for anything, it's general computing and by that, we mean being able to run just about any kind of software. And this time, we're going to show you how you can get your Android apps to run on your Windows machine through Bluestacks emulation.

Text by *Salehuddin Husin*

Add a Google Account
Do you want to add an existing account or create a new one?

PHOTOGRAPHY JASPER YU ART DIRECTION KEN KOH

MORE INSIDE >

- UNDERSTANDING MU-MIMO
- MICROSOFT EDGE PERFORMANCE
- PANNING TIME-LAPSE VIDEO HACK

RUNNING ANDROID APPS ON A COMPUTER

by Salehuddin Husin

Are you the owner of a smartphone with a small display? Ever felt the frustration of hitting the wrong buttons on your teeny screen because of your oversized fingers? Did looking at a tablet with their massive displays made you feel inadequate? Well, we have just the thing for you. How you like to use run Android apps on your desktop or notebook?

First off, you're going to want to start up your browser and go to www.bluestacks.com. There are a couple of different emulators out there that basically does the same thing, but we like BlueStacks because it's simple, fast and easy to install. It also one of the few with active developer support, so updates and fixes are forthcoming.

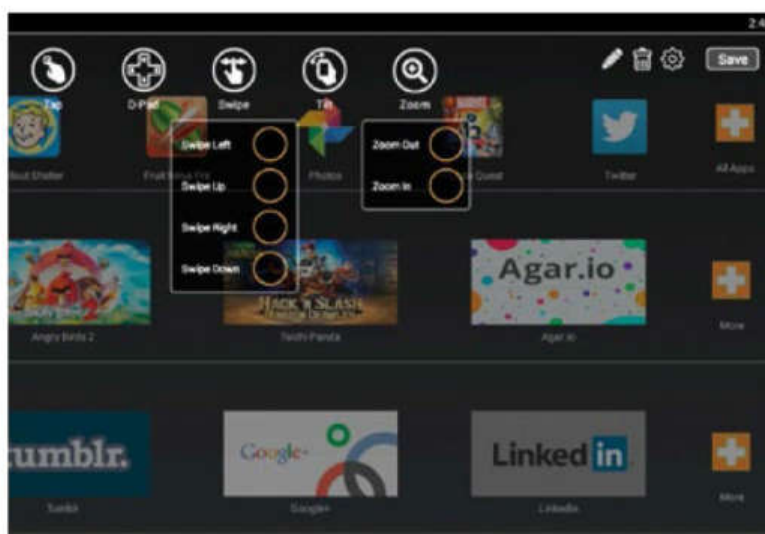
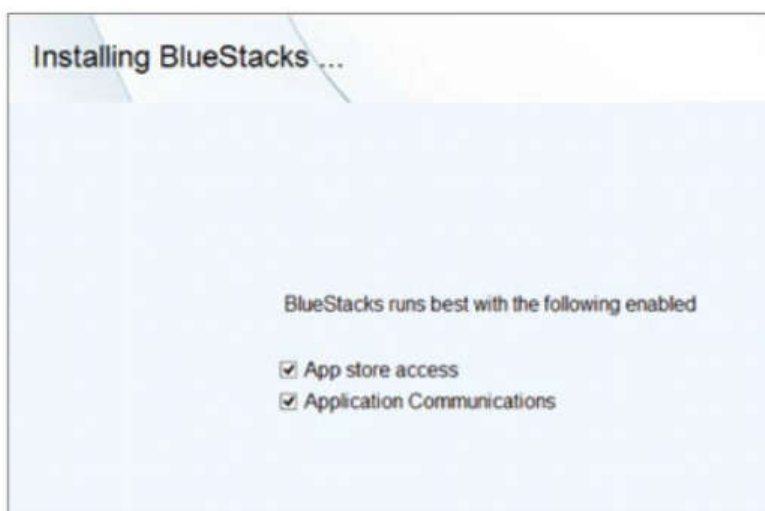
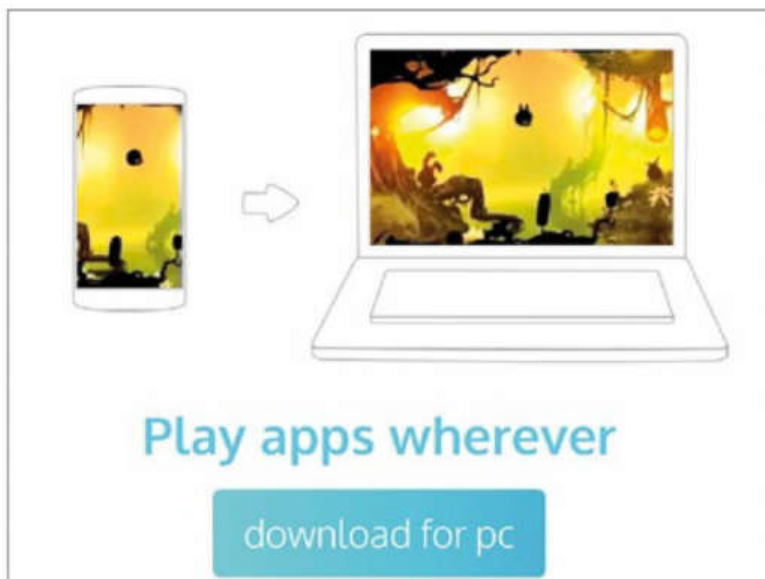
Once you've downloaded the appropriate version, you can go ahead to install it. For the purpose of this guide, we're installing the Windows version.

You can choose to install to any directory you want, it doesn't matter. When the option to install with App Store Access and Application Communications pops up, make sure both are ticked or else you'll find that you can't access and download from the Google Play store. Once everything is done, the app should load right up into Google's Play store. From here on out, you simply choose whatever you want to download.

Controls are easy, it's just like you're using a phone. To select, you just click your left mouse button. If you need to tap and hold, just press and hold the left mouse button and move in a direction. It's all pretty intuitive.

Of course, you can even customize your controls if you're so inclined. Just select the Keyboard icon on the bottom right of the screen and you can customize and use keyboard keys as shortcuts.

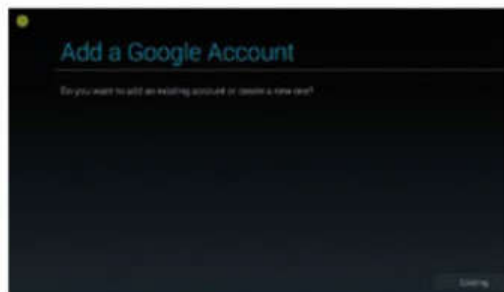
The other icons on the taskbar are are to complete an action using a specified program, windowed mode and to close BlueStacks.



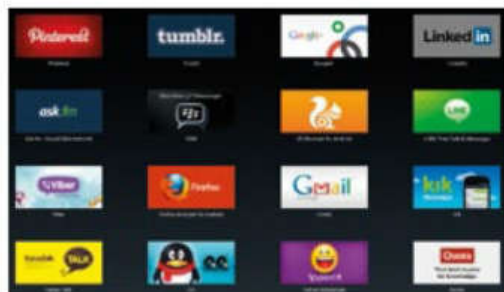
If it's your first time using BlueStacks from the PC, you'll need to enter your Google ID to log in before you can download anything.

Before you do this, we highly recommend you go to settings in Gmail and enable two-step verification for your account. That way, nobody can access it without your knowledge.

If you've registered on Google to be alerted whenever your account is accessed, you should be receiving an alert soon saying that your account was accessed on a Samsung Note 3. That's normal, that's just BlueStacks emulating a Note 3 device.



Once you've all settled in, you can start exploring the Google Play store. Generally, everything an Android phone can do, you can now do on your computer. Yes this even includes chat services like Whatsapp, though with Whatsapp Web, we don't really see a point.



Other than that, you can play the numerous Android games and apps readily available on the store. We've tried a couple of games, ranging from Fallout Shelter to Fruit Ninja and they work fine. Perhaps there might be a game or two that might not be compatible with the program, but we haven't found one yet.

If you're an iOS user and wonder if the move to Android is worth it, or an Android user with a crappy phone, BlueStacks is something you'll definitely want to try out.



HOW FAST IS THE MICROSOFT EDGE BROWSER?

by Ng Chong Seng

When Windows 10 was finalized back in July, Microsoft came forth to claim that the OS' new bundled browser, Microsoft Edge, is "blazing fast" and is beating Chrome and Safari on their own JavaScript benchmarks. Now that we're a few months in, are the claims still true?

There are many ways to evaluate a browser, but raw performance should be the number one criteria. According to Microsoft in July, versus Google's Chrome, Edge is 112% faster in the WebKit SunSpider benchmark, 11% faster in the Google Octane benchmark, and 37% faster in the Apple JetStream benchmark.

But with Chrome being updated a couple of times since, is Edge still ahead today? Also, how does it stack up against other popular browsers, like Mozilla's Firefox and its own Internet Explorer? Using a system based on an Intel Core i7-5557U processor and the latest version of each browser at the time of writing, here are some benchmark results.

SunSpider 1.0.2

(in ms, lower is better)



Octane 2.0

(higher is better)



JetStream 1.1

(higher is better)



HTML5test

(higher is better)



With the exception of SunSpider, IE 11 has fallen behind all the other browsers in terms of pure JavaScript execution. As it stands, Edge is still leading in JavaScript performance, ahead of both Chrome and Firefox in the SunSpider and JetStream numbers, but about on par with both in Octane. There is no doubt that this is due to the EdgeHTML engine that the Edge browser is using exclusively.

Microsoft has also beefed up support for HTML5 in Edge and the HTML5test score reflects this improvement. That said, it still trails

Chrome and Firefox, and lacks native support for Google's WebM video file format (but it's coming).

In short, the Microsoft Edge browser is fast and its performance numbers rank right up there with its illustrious peers. Other aspects like WebGL performance is also on the up, thanks to DirectX 12. With Windows now being positioned as a service, we expect Edge to be frequently updated too. This is important in the browser space as any lead can be overtaken if you don't keep up. Just ask IE.

REMOVING UNWANTED APPS ON YOUR SAMSUNG GALAXY NOTE 5 AND S6 EDGE+

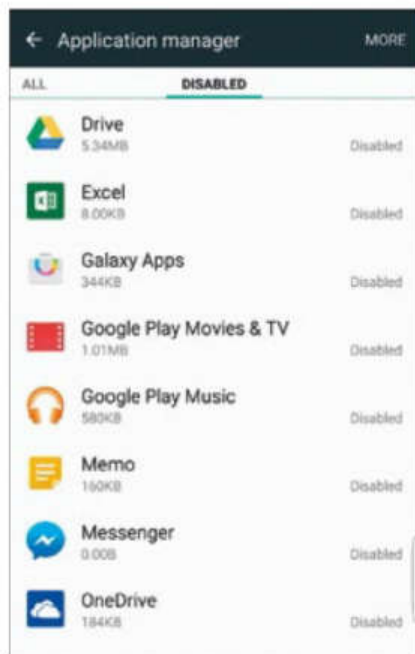
by Ng Chong Seng

The TouchWiz overlay on the Samsung Galaxy Note 5 and S6 Edge+ is the most streamlined we've seen so far, and this makes for a fast and smooth UI. While there isn't a lot of bloatware this time round, there are still some pre-installed apps that you may or may not want. Here are three ways in order of difficulty on how you can remove (or at least hide) them.

USING APPLICATION MANAGER

The easiest way to uninstall unwanted apps is through the Application Manager, which is found under Settings > Device > Applications. From there, find the All tab to see what's installed on your device. To prevent users from trashing items that are critical to the system's wellbeing, most can't be removed. But some apps can be uninstalled, such as Samsung Galaxy Life. For such apps, you will see an Uninstall button when you tap on them.

There will also be apps that are non-system critical, but which you can't remove, such as some of the Google and Microsoft apps, utilities, and social media apps. For these apps, instead of Uninstall, you'll see a Disable button. This simply hides them from your app drawer and prevents them from running, so it doesn't help if you're trying to reclaim some storage space. To reverse the process, just go to the Disabled tab to toggle the switch again.

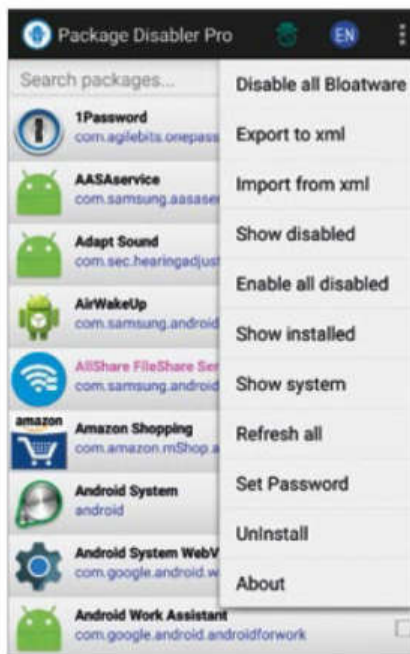


The Application Manager is fairly restrictive, but you can still find some apps to disable.

USING PACKAGE DISABLER PRO

But what if you wish to disable apps and services that the built-in Application Manager doesn't allow? You can turn to a third-party app on the Google Play Store called Package Disabler Pro. This is an app specifically designed to disable unwanted packages on Samsung devices, and it doesn't require you to root the device.

Disabling system apps in Package Disabler Pro is simple: just click on the package you want to disable. The free version has a limit on the number of packages you can disable (10 to 11), which is removed if you buy the full version that costs \$2. The full version also has advanced features, as such letting you export your disabled list, a search function, and a one-click bloatware removal tool. Of course, we only recommend disabling things that you're certain you don't need, and won't break critical system functions. In short, if you're uncertain what a package does, don't touch it.



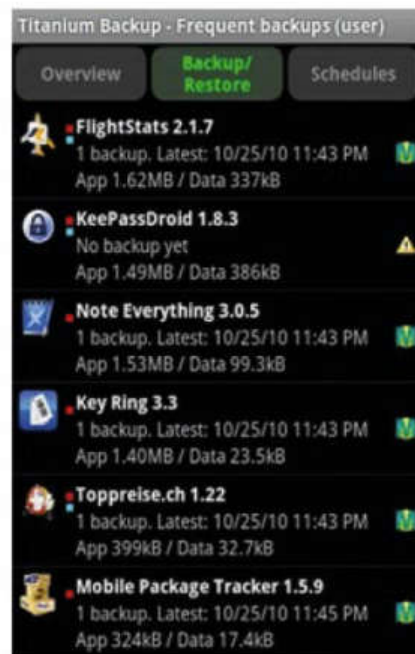
The best thing about Package Disabler Pro is that it lets you disable apps without requiring you to root the device.

USING TITANIUM BACKUP

The most advanced way to control your apps and data is to use Titanium Backup, though it'll cost you \$8.65 to enable all its powers. This is the app that many hardcore users turn to when they want to backup/restore their apps, or remove, disable, or "freeze" them. This is a very powerful app that can be dangerous if not used correctly.

Also, to use Titanium Backup, you need a rooted device. In a nutshell, this means giving yourself and the app you've chosen unrestricted access to the system files. For the most part, we don't recommend rooting your Note 5 or S6 Edge+. It will trip Knox (a built-in Samsung security feature) and disqualify your device from using security-focused features, like Samsung Pay. It also voids your warranty.

If you like to live dangerously, check out these two forum threads on XDA Developers (gohwz.ws/1NoPmOf and gohwz.ws/1NoPpJs) to find out more about rooting your new Galaxy devices.



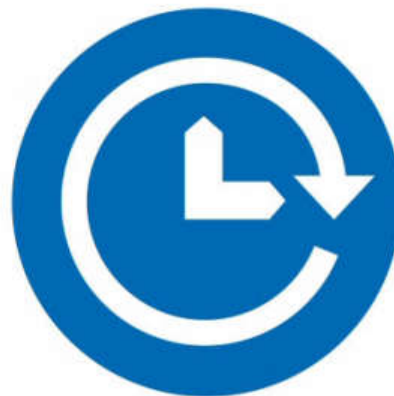
For backing up, disabling, and restoring apps, Titanium Backup is the gold standard. But it needs a rooted device.

THE PANNING TIME-LAPSE

Video hacks from our friends at BBC Earth.

by Marcus Wong

Natural phenomenon happens over an extended period, which is hard to portray in a few minutes. The solution commonly used on nature programs like BBC Earth is to shoot time-lapse video. Here's how to make a panning time-lapse rig without professional equipment.



HOW TIME-LAPSES WORK

Time-lapse videos essentially compress time, showing how things develop in a scene that may otherwise take hours, days or months in a matter of minutes or seconds. Think of it as a photographic version of the sketch-pad flip books that you used to do basic animations when younger. By keeping the camera steady, only the scene changes between frames, so by taking photographs at fixed intervals you'll see the scene develop before you.

Add the element of movement, and you'll be taken through time in the chosen direction. The catch of course, is that the camera must be kept decently leveled so the resulting footage isn't disruptively jerky.

HOW TO: PANNING TIME LAPSE WITH JUST YOUR SMARTPHONE AND A KITCHEN TIMER

Simply attach your smartphone to a standard kitchen timer and start recording in time-lapse after you start the timer. If you've properly gaffered it up (or used enough Blu Tack), your smartphone will stay perfectly in place, giving you an excellent panning time-lapse video.

Here's an example of how to secure your smartphone:



Some basic tools to get a professional-looking panning time-lapse.

PICTURE HYPERLAPSE, FRAMEODRAPHER, FRAME LAPSE, LAPSEIT, OVERLAPSE ILLUSTRATION IAN CHONG



1. You'll want to wind the timer up first so you don't have to fiddle with it again later.
2. Next, place your smart phone with the screen against the handle of the timer and use Blu Tack to hold it up.



3. If your timer uses a knob, just place a big wad of Blu Tack on top of the knob and press down into it with your smartphone until enough has sunk in for it to be secure.
4. Hit the record button on screen and place the entire setup on a flat stable location to let the recording run. Wait for the time lapse to complete!



5. Alternatively, you can also use masking loosely over the phone to hold it in place. Just make sure the timer is still able to turn.

LIST OF APPS WITH TIME-LAPSE FUNCTIONS.

Don't have an iPhone 6 or 6 Plus? Here are a list of apps with time-lapse functions that should get you up and running:



Hyperlapse (iOS only, Free)

Hyperlapse features a simple interface that doesn't require you to set too many settings. Just shoot a scene, then decide how much to slow it down or speed it up later.

Hyperlapse even has stabilization features built in to ensure that your footage stays optimally viewable, even if you were taking it from the back of a moving truck!



Frameographer (iOS only, \$4.99)

Frameographer is a paid app, but it's full-featured and concentrates solely on one thing: creating time-lapses.

Set the capture rate by way of a simple slider, choose to add music, then easily adjust things like exposure, focus and shutter. There's a function to create Stop Motion videos, and the app makes it easy for you to save your work and continue on the project another day. Edit down to the shot-by-shot level so you can remove offending frames and remove them.



Framelapse (Android, Free)

Framelapse is a simple point-and-shoot time-lapse app that works very much the way Hyperlapse does. You're given the option of setting recording duration with full

control over frame interval as well as basic zoom and autofocus functions. There's also no rendering time required for video so playback can begin automatically after recording. However, MediaTek devices are not supported, so you'll want to check your device before proceeding.



LapseIt (Android and iOS, Free. Pro version costs \$2.98)

LapseIt has a full set of settings so you can specify the capture interval (down to milliseconds), number of frames, resolution size and whether

or not to dim the display to save power during capture. The Pro version allows for capture in up to HD 1080p (1,920 x 1,080 pixels) quality and will let you add music to your time-lapse sequences, but for most users the free version should do fine.



Overlap (Android, Free)

Overlap requires you to manually take each capture of the time-lapse, making it great for stop motion videos, and for events that happen over a longer period of time. How to

get every shot to fall in place? Well that's where a handy overlay feature comes in, letting you align your camera to the last shot. Multiple projects can be created at a time, so you're not just stuck doing the one time-lapse at any one time.

HIGH BANDWIDTH MEMORY DEMYSTIFIED

by Koh Wanzhi

HBM has the potential to pave the way for 4K gaming and bandwidth-hungry applications. What is it though and why is it a huge improvement over traditional GDDR type memory?

If you've kept up with developments in PC hardware lately, you might have heard that AMD recently released two new flagship cards – the Radeon R9 Fury and Fury X – equipped with a new-fangled memory type called High Bandwidth Memory (HBM).

HBM turns much of the conventional wisdom about video memory



on its head. The NVIDIA GeForce GTX Titan X came with 12GB of GDDR5 memory, which makes the 4GB of HBM on AMD's Fury series look scarily inadequate for cards of their stature. However, less is actually more with HBM, and here's why.

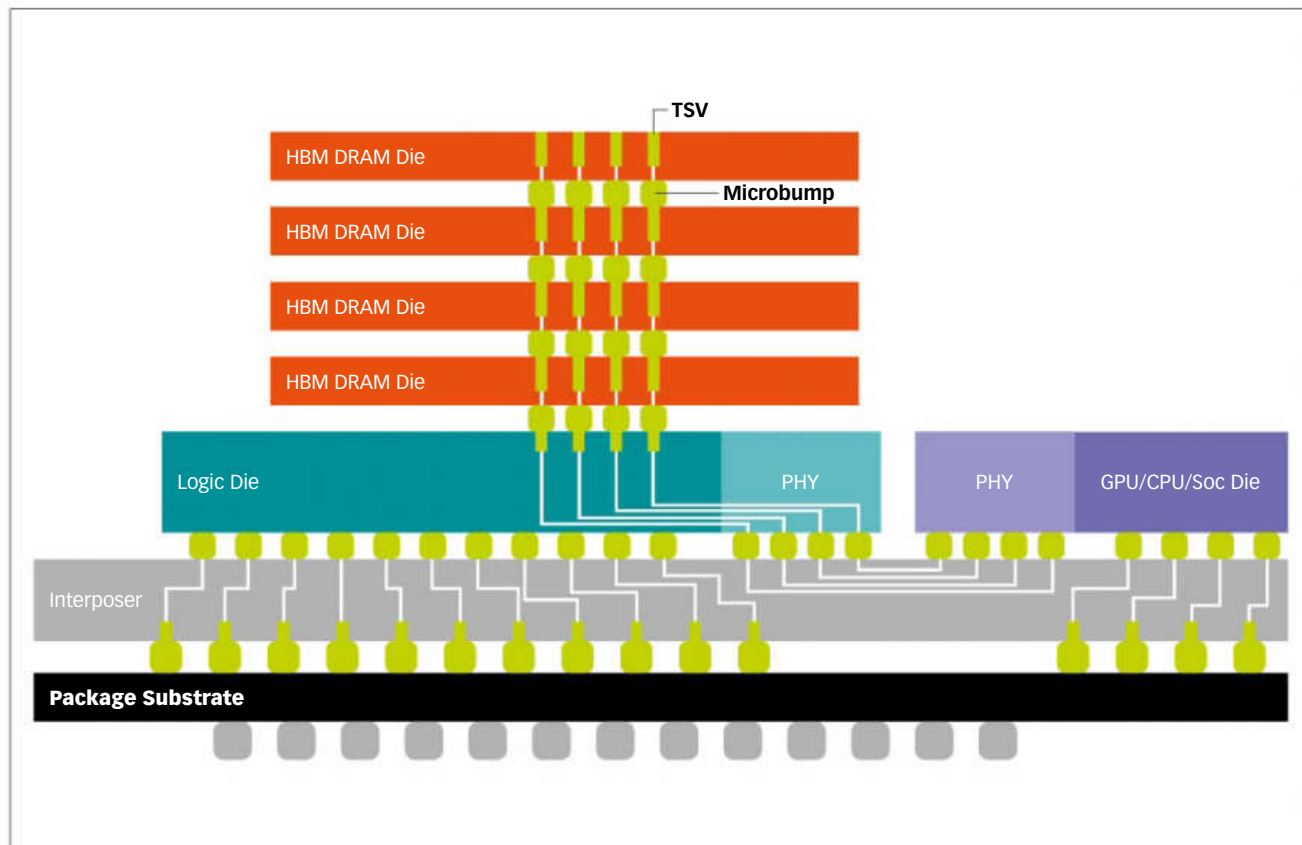
STACKED MEMORY CHIPS

HBM involves stacking memory chips vertically like a skyscraper. In the case of the Radeon R9 Fury X and Fury, four such memory chip towers are arranged in close proximity around the GPU die. Each tower consists of four 256MB dies stacked on top of a logic die, which amounts to 1GB per tower and a total of 4GB per card.

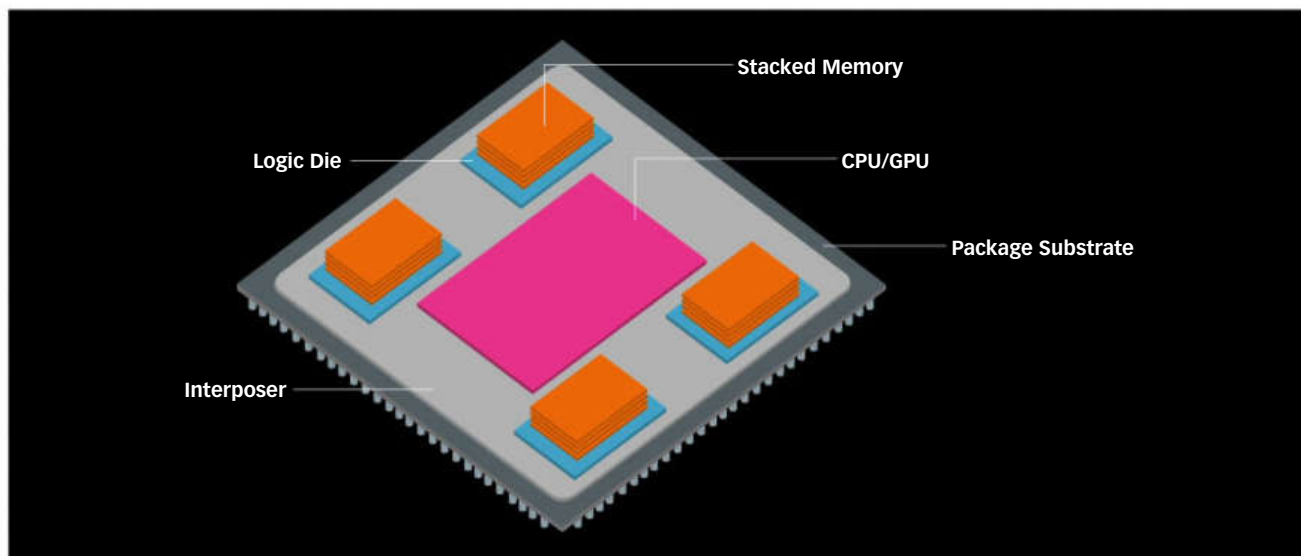
Both the HBM towers and the GPU sit atop an ultra-fast silicon-based interconnect called an interposer, which connects the memory to the GPU. They are all linked to each other and the interposer via microscopic wires called Through-Silicon Vias (TSVs) and structures called microbumps.

Finally, the interposer itself is positioned on top of the package substrate. This on-package integration of memory and GPUs actually isn't new – one of the solutions to increase the speed or bandwidth of a particular component has always been to integrate it onto the CPU or GPU die.

However, this has always proved costly, and attempts to integrate DRAM onto CPU dies have run into significant space constraints. With HBM, the principle of increasing bandwidth by decreasing memory proximity to the die is exploited, space constraints are overcome by stacking the memory chips, and on-package (as opposed to on-die) integration keeps costs down.



PICTURE AMD ILLUSTRATIONS IAN CHONG



Four HBM stacks surround the GPU die in close proximity, providing an ultra-wide 4,096-bit memory bus.

ULTRA-WIDE BANDWIDTH AND POWER EFFICIENCY

While these HBM stacks are not physically integrated onto the GPU die, they are so closely connected that they are almost indistinguishable from on-die integrated RAM. This close proximity enables extremely wide memory bus widths, and consequently allows much lower memory clock speeds to be used to achieve the required performance.

This is because with GDDR5 memory, individual DRAM chips are placed side by side and connected via long copper traces on the PCB. However, HBM dies are so close to the GPU that the traces that connect them are much shorter, which thus enables much wider memory bus widths.

On the AMD Radeon R9 Fury X and Fury, each HBM tower has a 1,024-bit memory bus width, and the four towers flanking the GPU die combine for a 4,096-bit bus width, the highest on any GPU so far. From buses just hundreds of bits wide, we've rocketed to seeing figures in the thousands, and this is just a first-generation product.

Both of AMD's HBM-equipped GPUs have a 512GB/s of memory bandwidth, beating even the 336.5GB/s of the NVIDIA GeForce GTX Titan X.

Power consumption is also much reduced because the closer proximity enables more efficient communication between the memory and GPU. Input voltage is down to 1.3V, from 1.5V on traditional GDDR5 memory.

SIZE MATTERS...LESS

At the start of this article we mentioned how 4GB of HBM may seem paltry compared to today's much larger GDDR5 capacities, but AMD does not see its memory capacity as a potential performance limitation. Larger GDDR5 memory capacities have been an inevitable byproduct of the need to increase memory bandwidth by increasing memory bus width, which in turn required more GDDR5 chips. AMD says that this has actually resulted in more capacity than is actually needed, and unused frame buffer capacities effectively serve no functional purpose whatsoever.

Now, because of the impressive 512GB/s of bandwidth made available by HBM, AMD no longer needs to increase memory capacity for the sake of more bandwidth. Instead, it all comes down to efficiency and how effective drivers are at managing the 4GB frame buffer.

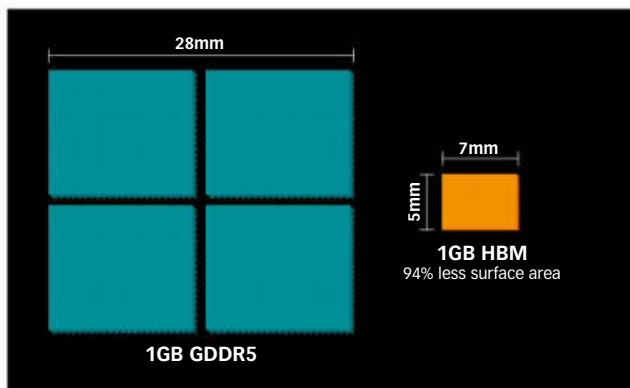
Nevertheless, we expect larger HBM capacities in the future, either by utilizing larger DRAM dies per stack or increasing the number of stacks.

SPACE SAVINGS

And just like how skyscrapers help make the most of scarce land, HBM stacks enable significant space savings on PCBs. 1GB of GDDR5 may take up 672mm², but 1GB of HBM would require just 35mm² of space, which translates into over 90% in space savings.

As GDDR5 struggles to keep up with growing memory bandwidth demands, more chips are required, which in turn require more space. Clearly, that isn't sustainable, and HBM helps reverse the burgeoning size of higher-end cards. The Radeon R9 Fury X's PCB is just slightly over 19cm long, 30% shorter than that of the Radeon R9 290X, the previous generation's flagship.

HBM will enable much more compact high-end cards, which will in turn allow powerful systems to be assembled in cases with far smaller space footprints.



HBM provides significant space savings over GDDR5 because of its stacked structure.

WHY HBM?

Put simply, GDDR5 is fast approaching the limits of its specification. Bandwidth demands continue to grow, and for GDDR5 to keep up, it has had to increase its power consumption accordingly. However, each additional GB/s of bandwidth it squeezes out is beginning to consume too much power to be a sustainable or cost-effective option.

HBM effectively provides more bandwidth for less power, allowing GPU manufacturers to continue to increase bandwidth without running into a "power wall". In hard numbers, that's over 35GB/s of bandwidth per watt, compared to GDDR5's 10.66GB/s – a 3.5x improvement.

UNDERSTANDING THE CONCEPT OF MU-MIMO

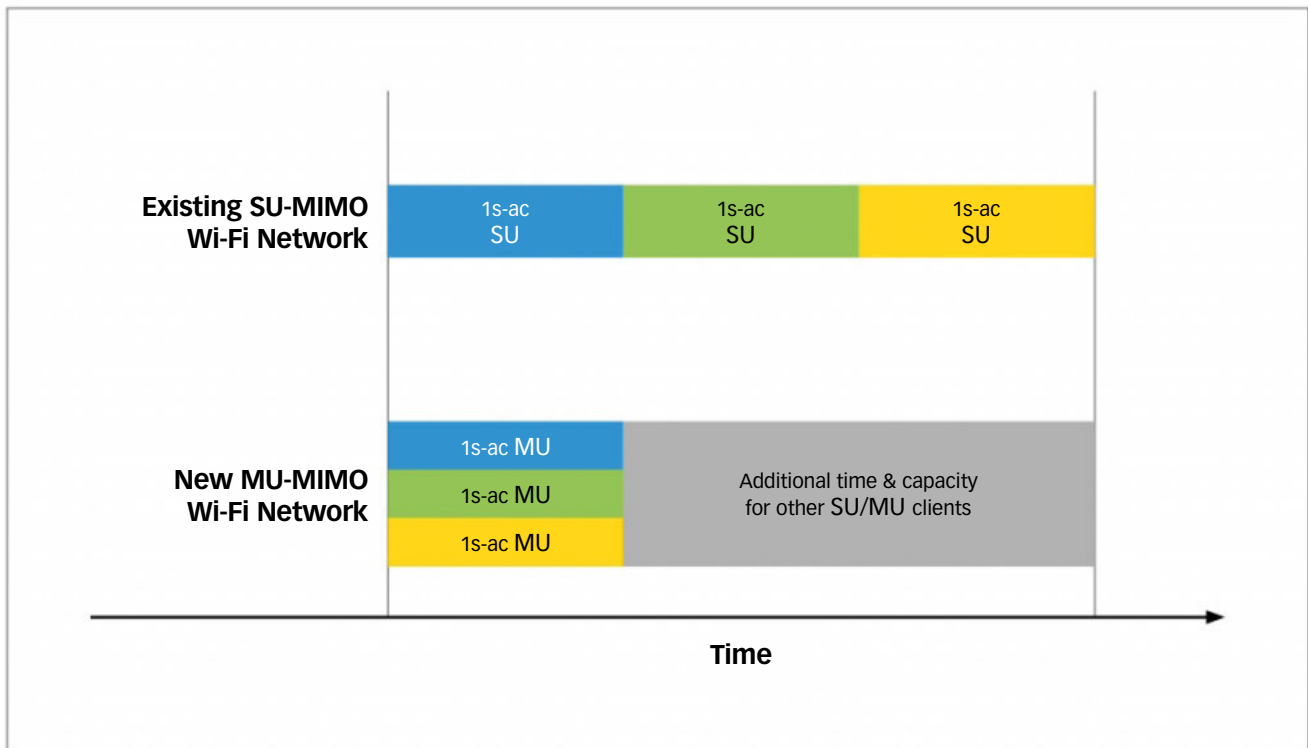
by Kenny Yeo

MU-MIMO is shaping up to be the next big thing in wireless technology, but how can it help improve wireless performance and how does it work? Sit back and let us tell you.

Let's start from the top. MIMO refers to Multiple Input Multiple Output and refers to sending and receiving multiple data signals on the same radio channel and at the same time using a technique called multipath propagation. Most wireless devices today employ MIMO to boost performance and a corollary to this is also the use of multiple antennas at both the transmitting and receiving ends to improve wireless performance. Using multiple antennas to transmit and receive data improves reliability and speed. This is why you sometimes see routers or client devices being referred to as 1x1 or 2x2 or even 3x3. The first number denotes the number of transmitting antennas, while the second refers to the number

of receiving antennas. For the most part, most routers and client devices use a symmetrical design.

However, the next part is unknown to most users and it deals with how most routers in the market today work. The vast majority of routers in the market today are SU-MIMO only or Single-User Multiple Input Multiple Output. As hinted by the name, SU-MIMO technology can only transmit to a single user (single device) at a time. This is why performance degrades rapidly as more and more devices are connected to the router. The router has to quickly serve one device and go on to the next, and if there are many devices connected, the "waiting time" gets longer and longer.

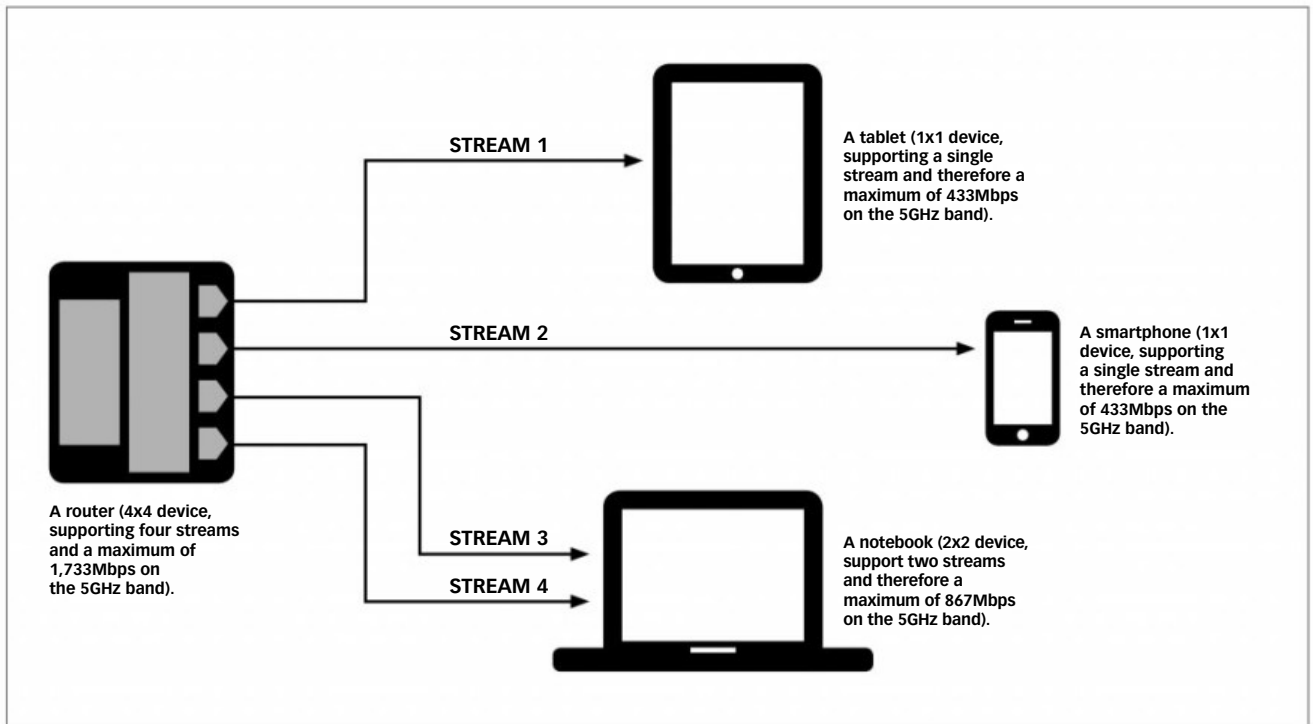


In this graph, we can see that MU-MIMO can help improve overall networking performance by transmitting data to multiple devices simultaneously; whereas traditional routers can only send data to a single device at one time. As a result, performance degrades significantly as more and more devices connect to the network, since each gets less and less time slice.

Because SU-MIMO technology restricts transmission to a single device at any one time, the router would only be able to transmit 433Mbps when it is time to transmit data to the smartphone or tablet, which also means that the remaining bandwidth goes to waste. Likewise, when transmitting to the notebook, the remaining 867Mbps is unused even if theoretically there is sufficient bandwidth for additional devices. Hopefully, it is clear at this point that if you add more and more devices to the network, the length of time it takes to complete

a full cycle and serve all devices becomes longer.

This is where MU-MIMO comes in. Using the same devices above as an example, MU-MIMO allows the router to transmit data to multiple devices simultaneously - hence the "MU" or Multi-User part of its design. On the most basic level, what this means for the router is that it can make full use of its 1,733Mbps bandwidth to transmit data to multiple devices simultaneously. This cuts down on waiting time and improves performance.



Older routers can only transmit data to a single device at any one time, but MU-MIMO lets routers maximize their performance potential by transmitting data to multiple devices simultaneously.

The technology promises to greatly improve overall performance, but it is by no means perfect. MU-MIMO has some limitations and one of it is that the maximum number of clients it can transmit to simultaneously is one less than the number of spatial streams that it supports. And since most routers that support MU-MIMO support four spatial streams, this means that the maximum number of clients it can transmit to simultaneously is three.

Beyond this is also the question of positioning and beamforming, a common feature in current 802.11ac routers. With multiple clients to transmit to at the same time, some interference is unavoidable and this can lead to a degradation of performance. Ideally, clients should be spaced out like a fan in front of the router, as interference increases if clients are positioned too close to each other. But even though this is unlikely to happen in the real world, the good thing is that clients are unlikely to be constantly downloading data non-stop,

unless they are downloading large files or streaming data like video. But the bottom line is that this shouldn't be a big concern for most users.

The biggest downside to MU-MIMO, however, is that it requires both compatible client devices to work. It is not just a matter of a simple patch or firmware update. This means that few existing devices actually support MU-MIMO unless they were already equipped with the latest wireless adapters. Some examples of devices that claim to support MU-MIMO at this point are Xiaomi's Mi 4i smartphone and Acer's new E series notebooks. Fortunately, word on the grapevine is that future devices will support MU-MIMO, so hopefully it won't be long before MU-MIMO catches on and adoption becomes widespread. If you're going to purchase or upgrade your router today, the smart bet will be on MU-MIMO for better future-proofing.



The Linksys EA8500 MaxStream AC2600 MU-MIMO Smart Wi-Fi router is the first router to support new MU-MIMO technology right out the box.

GHOST IN THE MACHINE

by Koh Wanzi

All Hallows' Eve is just around the corner, and we've rounded up some apps to indulge in some good ol' scares and make the best of Halloween. So even if you aren't going to dress up as Freddy Krueger, there's still fun to be had! We're not sure about you, but we certainly love ourselves a bit of Halloween candy, and maybe some pumpkin.

FIVE NIGHTS AT FREDDY'S 4

iOS (\$3.98), Android (\$4.10), Windows Phone (Free)



This is the latest installment in the Five Nights at Freddy's series, serving up a fresh platter of

delicious terror for the intrepid mobile gamer. Spooks with cuddly names like Freddy Fazbear, Chica, Bonnie, and Foxy make a return as you stumble around a darkened house and try not to get swallowed up by what's lurking in the shadows. The game takes you back to your worst childhood nightmares as you peer into sinister closets and hope you don't see a yellow-eyed, toothed visage grinning back at you. Onscreen navigation prompts help you get around, and you're equipped with just a flashlight.

ZOMBIEBOOTH 2

iOS, Android, Free



ZombieBooth 2 is a frivolous exercise in photo editing. Surely it's more fun to turn your eyes

a rabid yellow than it is to look for the best Instagram filter? The app provides you with a wide selection of zombie parts. So regardless of whether you'd like a set of rotting enamels or an undead-approved complexion comprising putrid flesh and exposed sinew, the app probably has what you need to perfect your look as a zombie. It's also interactive, so you can watch as your zombie self leers in the direction of your finger. The app will even help to animate the final product, complete with effects like breathing and growling.

CRAFTSY

iOS, Android, Free



Okay, this isn't exactly a Halloween-themed app, but it's chock-full of crafting ideas

to help you do up a great costume. If you're the handy sort, there are even classes on how to design and stitch together your own costume. With classes like "The Costume Box" that show you how to fashion your own sword, scabbard, and hooded cape, you could be your very own – but not Gotham's – caped crusader. And should you need help or inspiration, the app also comes with an interactive platform for you to bounce ideas off instructors and classmates.

IPOE

iOS (\$5.98), Android (\$3.24)



There's a huge amount of literature behind Halloween staples like

vampires, werewolves, and ghouls, so what better way to get in touch with the occasion than through the master of the macabre himself? IPoe is an engagingly illustrated collection of Edgar Allan Poe's best works, with classics like The Tell-Tale Heart and The Masque of the Red Death. Complete with original artwork and soundtrack, the app promises to immerse you in Poe's masterful tales. A biography of Poe himself caps things off, so you can learn about both the man and his work!



There are all manner of scares just waiting to get a jump on you.



Shop around for the perfect look from a wide array of rotting body parts.



Classes like The Costume Box could help you make your own Halloween costume.



Stories like The Tell-Tale Heart come to life with high-quality illustrations.

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The Sony Ericsson P910i (2004) boasted multiple input methods with a keypad that flips out to reveal a keyboard, which can be removed entirely in favor of stylus input and a larger screen.



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